New Stress Studies

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You already know that stress can affect your mood, but did you know it can increase the risk of stroke, hamper learning, suppress your growing network of brain neurons and weaken the protective blood-brain barrier? If this doesn't pique your curiosity, maybe you would like to know why salmon die right after they spawn. Whatever your interest, find the results of recent stress studies here.

Brain Hormone Solves Salmon Death Mystery-Study

Salmon amaze us with their spectacular leaps up waterfalls, in their single-minded quest to return and lay eggs in the freshwater stream of their birth. Then they die; but why?

"If you catch salmon right after they spawn, just when they are looking a little green abound the gills, you find they have huge adrenal glands, peptic ulcers, and kidney lesions; their immune systems have collapsed, and they are teeming with parasites and infections.

"Moreover, the salmon have stupendously high glucocorticoid concentrations in their bloodstreams. When salmon spawn, regulation of their glucocorticoid secretion breaks down. Basically, the brain loses its ability to measure accurately the quantities of circulating hormones and keeps sending a signal to the adrenals to secrete more of them. Lots of glucocorticoids can certainly bring about all those diseases with which the salmon are festering.

"Is this glucocorticoid excess really responsible for their death? Yep. Take a salmon right after spawning, remove its adrenals, and it will live for a year afterward."

Implications: Chronic stress in our lives creates too high a level of stress hormones. Prolonged exposure to these hormones leads to serious medical problems.

Stress Hormones and Aging-Study

Elizabeth Gould, Researcher at Princeton University, notes that "levels of stress hormones rise with aging, and are very likely to be responsible for the decline in neurogenesis. (The formation of new neurons) The good news, though, is that the aging brain doesn't appear to lose the ability to generate new neurons," when you relieve the stress.

In animal studies at the National Institutes of Neurological Disorders and Stroke, neuroscientists found that the production of neurons in the hippocampus continues throughout adulthood, but dramatically decreases in old age because of high levels of stress hormones produced by the adrenal glands.

When researchers removed the adrenal glands from aged rats, it led to the growth of new brain cells (neurogenesis) in the hippocampus, further suggesting that "decreased formation of new neurons may contribute to age-related memory deficits associated with high corticosteroids, and that these deficits may be reversible."

Implications: Reducing chronic stress in our lives reduces the production of excess stress hormones. Old or young, this enables us to grow new brain cells in the hippocampus (this is where initial memories are stored) and combat the effect of memory loss.

Stress and Stroke-Study

A study that followed 2,303 Finnish middle-aged white men for 11 years reported that stress was linked to increased stroke risk. "We've found that exaggerated blood pressure reactions to stress are related to a greater risk of having a stroke," says the study's lead author Susan A. Everson, Ph.D., an epidemiologist at the University of Michigan.

The men who had above-average systolic blood pressure spikes (in anticipation of an exercise test) had a 72% greater risk of any stroke, compared to men with less reactive blood pressures. These men also had an 87% greater risk of ischemic stroke – those caused by blood clots rather than bursting of a brain vessel.

Everson says this study provides more evidence of mind-body connections in disease development. The body's sympathetic nervous system reacts to mental or emotional stress by increasing blood pressure, heart rate, and respiration – a reaction linked to the development of chronic high blood pressure and atherosclerosis, two known risk factors for stroke and heart disease.

Implications: It's not just the actual stressor that creates stress for us but there is an important mind-body connection to consider. Your perception of the stress determines the amount of hormones produced.

Stress Weakens the Blood-Brain Barrier-Study

Stress can dramatically increase the ability of chemicals to pass through the blood-brain barrier, the complex system of blood vessels that protects the brain from toxins circulating in the bloodstream.

During the Gulf War, to protect themselves from chemical and biological weapons, Israeli soldiers took a drug called pyridostigmine. Nearly one-quarter of them complained of headaches, nausea, and dizziness – symptoms which occur only if the drug reaches the brain. Pyridostigmine molecules generally can't get into the brain, so why had the side-effects increased during combat?

An Israeli biochemist and physician wondered whether the stress of war might somehow have increased the permeability of the blood-brain barrier. The two researchers took a group of mice and stressed some by dunking them in water. They then injected the rodents with a dye and measured its intensity in the autopsied brains. They found that the dye had passed much more readily into the brains of the stressed animals.

Implications: The fact that stress can dramatically increase the ability of chemicals to pass through the blood-brain barrier has enormous implications, since many drugs are developed under the assumption that they will not enter the brain.

Sustained Stress Impairs Learning-Study

Extreme or sustained stress can damage the brain's hippocampus, making it difficult to learn new things. Animal research at the University of South Florida found that stressed rats continuously explored their surroundings, as if they had no ability to retain memory.

They behaved as if they had sustained damage to their hippocampus, says psychology professor Dr. David Diamond, a behavioral neuroscientist at the Tampa Veterans Affairs Hospital.

Implications: Excessive cortisol ages the hippocampus and ultimately affects memory and learning.

Memory Loss: Is It Always Age-Related-Study

New research shows that stress and depression may cause some forms of memory loss. The research is important because it suggests that not all memory loss is an inevitable part of aging.

In a normal stress response:

1. Stress triggers the amygdala to release stress hormones which enhance the memory process.
2. Memories of the event are first stored in the hippocampus.
3. Then a chemical reaction encodes them into neurons in the cerebral cortex, cementing them into long term memory.

If you look at a patient as having irreversible dementia, you won't do anything, says Sonia Lupien, Ph.D., a neuroscientist at Douglas Hospital in Montreal. If you treat the depression, you can stop the increase of cortisol and prevent the memory loss.

Studies show that prolonged depression or stress leads to elevated levels of cortisol, a stress hormone produced by the adrenal glands. This in turn appears to shrink or atrophy the hippocampus, the sea horse-shaped part of the brain associated with many kinds of memory and learning.

The hippocampus is an organ of the brain that is particularly vulnerable to stress and stress hormones.

While cortisol levels normally fluctuate over the course of a day and night, they often soar when a person is faced with a stressful situation, such as a job interview or a school test. Studies have shown that this affects memory. For example, researchers reported in the April 2000 issue of Nature Neuroscience that people taking cortisone pills (which

metabolize to cortisol in the body) were not as good at remembering a list of words as people taking placebo pills.

For many people, depression appears to cause similar damage; their cortisol levels remain slightly elevated as long as they are depressed. This moderate but constant drip-drip of the cortisol faucet appears to wear down the hippocampus.

In a review of several long-term studies published in the October 1999 issue of Reviews in the Neurosciences, Dr. Lupien concluded that this process is particularly damaging in the elderly.

But there's no strong evidence that the hippocampus shrinks as a part of normal aging. In one recent study, Yvette Sheline, M.D., a professor of psychiatry at Washington University in St. Louis, used magnetic resonance imaging to measure the hippocampus of 48 women aged 23 to 86, half of whom had a history of clinical depression, half of whom did not.

The women with depression had smaller hippocampi and scored lower on memory tests than the non-depressed group, regardless of age.

We expected to see an effect from aging. Instead we saw significant volume loss only in patients with a history of depression, says Sheline, whose study was published in the June 14, 1999 issue of the Journal of Neuroscience.

Research shows that when depression is treated, cognitive function, including memory, improves. The earlier we can recognize the symptoms, the more likely we are to arrest or slow down the degeneration of the brain, McEwen says.

Still, more studies are needed to fully understand the connection between emotions and memory, cautions Mony de Leon, a psychiatrist and professor at New York University's medical school. The cortisol-hippocampus research is an exciting start, he says, but much remains a mystery.

For example, researchers haven't yet determined what role, if any, cortisol plays in Alzheimer's disease. Studies show all people with Alzheimer's have hippocampal damage, but their cortisol production varies.

All of these things remain somewhat foggy, says de Leon. It requires much more extensive investigation.

Implications: Prolonged stress or depression leads to elevated levels of cortisol, a stress hormone produced by the adrenal glands. This in turn appears to shrink or atrophy the hippocampus, the sea horse-shaped part of the brain associated with many kinds of memory and learning.