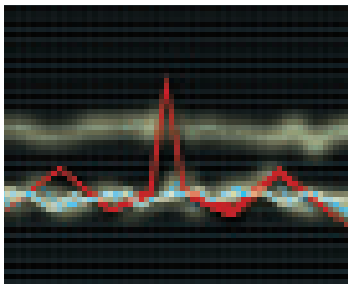

The Biology of Stress

By Pamela Young, Director of Publications

A four-part series exploring the physical impact of stress. Up first, understanding your stress load.

Stress is a word we all know. But it's often easier to describe the stressors than the effects of the stress itself. Stressors can be emotional or physical, acute or chronic and can stem from events we think of as positive (like a wedding) or negative (like a layoff or physical injury). But what are the physical ramifications? The next four issues of the CFIDS Chronicle *will explore the biology of stress—looking at its impact on various systems of the body. In this first installment, we examine the overall load stress puts on our bodies.*

Scientists increasingly look at stress as an important factor in the origin of illness. Studies show that civil servants in stressful jobs are more prone to high blood pressure and heart disease. People under repeated stress tend to show early memory decline as they age. Through science, we're realizing that the phrase "can't handle the pressure" may be more accurately applied to our bodies than our minds.

When threatened or stressed, our bodies mount a chemical response. Though this response can affect our emotions, it begins and ends in the body. Without it, we would be unable to react effectively to danger, infection, hunger, extremes of temperature or other challenges. But the same stress responses that can ensure our immediate survival can also threaten our long-term physical well-being.

Dr. Bruce McEwen of Rockefeller University in New York describes the interplay of physical and emotional stress in terms of *allostatic load*. As he explains it, allostatic systems allow the body to respond to stress and work toward a return to balance (allostasis). These systems include the autonomic nervous system (which controls heartbeat, blood pressure and similar functions); the hypothalamus, pituitary and adrenal glands (which work together to produce a hormonal response); and the cardiovascular, metabolic and immune systems.

Under normal circumstances, we react or adapt to stressors and our body returns to routine functioning. But when stressful events persist or recur frequently, the allostatic load on these systems can become too burdensome to process effectively. This accumulated load creates wear and tear—essentially becoming the price the body pays for doing its job less efficiently or being overwhelmed by too many challenges.

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What makes up our individual allostatic load is far from simple. Genetics play a role, as does what happens to us in life—trauma, good or bad fortune, caring or neglectful parents, failure or success in our goals. Even boredom can add to the load. How we live, what we eat, whether we smoke or not and whether we are active or sedentary are all part of the package. And chronic illness, like CFS, both contributes to allostatic load and may be intensified by it.

Although the causative factors are complex, the results are traceable. For example, stress-induced hormone secretion (cortisol) and overactivity of the autonomic nervous system can produce elevated levels of sugar in the blood (hyperglycemia). If prolonged, this can result in a rise of insulin and ultimately lead to Type 2 diabetes. In a sort of cascading cardiovascular effect, elevated autonomic activity and too much insulin promotes hypertension.

On another front, when the immune system is under chronic stress, it's unable to function at sufficient levels, making it harder for the body to fight infection and to heal itself. And for people who produce too little cortisol, as is often the case in CFS, there is nothing to contain the release of inflammatory agents,

which can quickly go from aiding healing to putting more wear on the body. In short, high allostatic load prevents the body from regaining balance, and the resulting state can grind down our systems.

Allostatic load can be evaluated by measuring a number of physiologic factors, including blood pressure, heart rate, glucose control and the level of stress hormones in urine. Waist-hip ratios and deposits of abdominal fat are also indicators of overactive stress hormone production. According to McEwen, the higher the load, the harsher the effects of stress and the more illness you may experience. For this reason, he believes allostatic load should be a factor physicians consider when diagnosing and treating illness.

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Research has long shown correlations between stress and health—from a 1998 study showing that people with lifelong economic hardship experience early signs of physical and mental decline to a 2005 Montreal study finding that people with an accumulation of stress hormones tend to experience spatial and memory problems. The idea of allostatic load provides a framework for understanding the health implications of stress and evaluating a course of action. ∎

Editor's update: Since this article was written, CDC research has uncovered connections between CFS and high allostatic load. This data, published in the April issue of *Pharmacogenomics*, also suggests that the genetic makeup of CFS patients may affect the body's ability to physically process stressors from injury, illness and other traumas.

HOW TO DECREASE THE LOAD

Lifestyle changes, including proper diet, mild exercise, plenty of rest and the development of positive coping skills, can make a difference in the body's ability to minimize the effects of chronic stress.

Increase your fiber, decrease your sugar

Many people reach for potato chips or sweets when feeling stressed. Although this provides short-term comfort, the resulting insulin elevation can combine with increased stress hormones to process the calories into abdominal fat, which puts even further stress on your system. It's a vicious cycle. Choosing a more prudent diet can have a counterbalancing effect on stress hormones and insulin levels. Higher fiber, fewer carbs, less processed sugar and fresh vegetables can help.

Get consistent exercise and generous rest

Mild but regular exercise can help regulate stress hormones and blood pressure as well as improve cognitive functioning. But, as always, people with CFS should exercise gently for brief intervals alternated with longer rest periods. Adequate sleep is also important to reducing allostatic load.

Make choices that reduce sources of anxiety

Some stressors can be mitigated by your own actions. When possible, take steps to reduce financial burdens. Try to remove yourself from chaotic or dangerous surroundings. Scale back commitments that leave you exhausted or anxious. Try thinking of new ways to view things you cannot change, but wish you could. Each reduction can help lower the load.

Strengthen social connections

Strikingly, people with more social ties have lower allostatic load scores, making social interaction an important factor in reducing the physical effects of stress. Fortunately for people with CFS, the strength and quality of the *connections* matter as much or more than the number of *events* you attend. Meaningful conversations, keeping in touch by phone and acknowledging the support of loved ones all have a positive effect. ∎

In the next issue!

Stress is more than an emotional catalyst. It triggers physical responses that can affect our health. Join us in the summer issue of the *CFIDS Chronicle* for the second installment in this four-part series exploring the biology of stress. Next up: stress and the immune system.