Mathematical model could help diagnose and treat stress disorders

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(PhysOrg.com) -- Over 20 million people in North America suffer chronic stress-related diseases. But two University of Alberta researchers may be on the fast track to treating these illnesses.

Amos Ben-Zvi, Gordon Broderick and scientist Suzanne Vernon have discovered that the human body can swing from its normal and healthy state to a permanent unhealthy state. But Ben-Zvi and Broderick worked with Vernon, the director of the Chronic Fatigue Immune Dysfunction Syndrome Association of America, on a mathematical model that has shown that the body can be returned to its healthy homeostasis through the use of hormones rather than through pharmaceutical treatments.

The body's natural, stable state is controlled by many systems, including the combined function of the hypothalamus, pituitary and adrenal glands. This is where the potential treatments come in. The researchers brought biology and mathematics together to systematically map the dynamics of stress response. In doing so, Ben-Zvi and Broderick have found a theoretical way for the body to use its own hormones.

The benefits of this discovery are twofold: Ben-Zvi and Broderick, who are both chemical engineers, have created a mathematical model that could help physicians diagnose and treat sufferers of diseases like chronic fatigue and post-traumatic stress disorder. Plus, the ability to swing the body back into a healthy state may mean that many no longer have to rely on life-long drug treatment dependency. "This type of approach is nice in the sense that you're working with the body, you're

not working against the body," said Ben-Zvi.

But before their model can be applied, a lot of work needs to be done. Now that they have the data, they need to analyze it further and calibrate the model so it can be applied beyond abstraction.

"We're going to address questions [including] how complex or how detailed the model has to be to produce reliable strategies," said Broderick.

"That's what makes this tool very useful. You can look at a variety of models and for each model you can design a set of experiments that validate one model versus another," said Ben-Zvi. "You can also, given a model you trust, design a set of treatments and specify a wide range of different types of treatments."

Once the researchers find a model that fits, the progression to clinical trials will be fast. Because the treatment involves hormones that the patient's body naturally produces, Health Canada and Federal Drug Administration approval isn't required.

"We're not trying a new drug, we're just trying a different application, a different dosage, a different spacing of doses of already approved drugs," said Broderick. "We're taking the express lane to therapy development by avoiding the development of new chemicals."

Provided by University of Alberta