Fluorogenic Cell-Based Biosensors for Monitoring Microbes

Lyndon B. Johnson Space Center, Houston, Texas

Fluorogenic cell-based sensor systems for detecting microbes (especially pathogenic ones) and some toxins and allergens are undergoing development. These systems harness the natural signal-transduction and amplification cascades that occur in mast cells upon activation with antigens. These systems include (1) fluidic biochips for automated containment of samples, reagents, and wastes and (2) sensitive, compact fluorometers for monitoring the fluorescent responses of mast cells engineered to contain fluorescent dyes. It should be possible to observe responses within minutes of adding immune complexes. The systems have been shown to work when utilizing either immunoglobulin E (IgE) antibodies or traditionally generated rat antibodies — a promising result in that it indicates that the systems could be developed to detect many target microbes. Chimeric IgE antibodies and rat immunoglobulin G (IgG) antibodies could be genetically engineered for recognizing biological and chemical warfare agents and airborne and food-borne allergens. Genetic engineering efforts thus far have yielded (1) CD14 chimeric antibodies that recognize both Gram-positive and Gram-negative bacteria and bind to the surfaces of mast cells, eliciting a degranulation response and (2) rat IgG2a antibodies that act similarly in response to low levels of canine parvovirus.

This work was done by Theresa Curtis, Noe Salazar, Joel Tabb, and Chris Chase of Agave BioSystems for Johnson Space Center. For further information, contact the Johnson Commercial Technology Office at (281) 483-3809.

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Johnson Space Center, (281) 483-1003. Refer to MSC-23797-1.

A Constant-Force Resistive Exercise Unit

Lyndon B. Johnson Space Center, Houston, Texas

A constant-force resistive exercise unit (CFREU) has been invented for use in both normal gravitational and microgravitational environments. In comparison with a typical conventional exercise machine, this CFREU weighs less and is less bulky: Whereas weight plates and associated bulky supporting structures are used to generate resistive forces in typical conventional exercise machines, they are not used in this CFREU. Instead, resistive forces are generated in this CFREU by relatively compact, lightweight mechanisms based on constant-torque springs wound on drums. Each such mechanism is contained in a module, denoted a resistive pack, that includes a shaft for making a torque connection to a cable drum. During a stroke of resistive exercise, the cable is withdrawn from the cable drum against the torque exerted by the resistance pack.

The CFREU includes a housing, within which can be mounted one or more resistive pack(s). The CFREU also includes mechanisms for engaging any combination of (1) one or more resistive pack(s) and (2) one or more spring(s) within each resistive pack to obtain a desired level of resistance.

This work was done by Paul Colosky and Tara Ruttley of Valeo Human Systems, Inc., for Johnson Space Center.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to MSC-23373-1, volume and number of this NASA Tech Briefs *issue, and the page number.*

GUI To Facilitate Research on Biological Damage From Radiation

Lyndon B. Johnson Space Center, Houston, Texas

A graphical-user-interface (GUI) computer program has been developed to facilitate research on the damage caused by highly energetic particles and photons impinging on living organisms. The program brings together, into one computational workspace, computer codes that have been developed over the years, plus codes that will be developed during the foreseeable future, to address diverse aspects of radiation damage. These include codes that implement radiation-track models, codes for biophysical models of breakage of deoxyribonucleic acid (DNA) by radiation, pattern-recognition programs for extracting quantitative information from biological assays, and image-processing programs that aid visualization of DNA breaks.

The radiation-track models are based on transport models of interactions of radia-