



# NSBRI Explorer

National Space Biomedical Research Institute • April 2008

## Smart Medicine: Managing Oxygen Requirements of Multiple Patients

While NSBRI acquires the majority of its science and technology projects through open solicitations, the Institute is increasingly recognized for its unique capabilities to perform directed research activities for NASA. Recently, Jay A. Johannigman, M.D., and Rich Branson, M.Sc., R.R.T. (University of Cincinnati) were supported by NSBRI to perform a directed medical task for NASA Space Medicine in the area of optimizing oxygen utilization.

The project developed a system for monitoring multiple patients' oxygen use during transport and involved the evaluation of oxygen requirements of ventilated soldiers leaving Iraq. Oxygen use during transport had never been measured. The study used an autonomous module that can change settings breath-to-breath based on the patient's needs, resulting in increased patient safety by maintaining an adequate oxygen supply to the body as well as net oxygen conservation.

For exploration, this system would allow an injured astronaut to be ventilated on the moon instead of forcing an emergency return. Also, the information gained will benefit mission planning by providing concrete knowledge of oxygen requirements. In addition to applications for astronaut health and safety, this system could change the way medicine is practiced for all types of patient transport and in disaster scenarios where patients outnumber medical caregivers.

The project also received funding from the Office of Naval Research and represents a collaborative effort of NSBRI, NASA, Wyle Laboratories, University of Cincinnati and Impact Instrumentation, Inc. Results were recently published in the *Journal of Trauma*. ♦

## Center of Acute Radiation Research

On Feb. 11, NSBRI released NSBRI-RFA-08-02, "Research Opportunities Soliciting an NSBRI Center of Acute Radiation Research (CARR) for Ground-Based Studies on Acute Radiation Effects." Proposals to form an NSBRI CARR should consist of a team of investigators working on multiple ground-based projects addressing acute radiation effects associated with solar particle events. Proposals, due May 8, must be submitted through the [NSPIRES](#) electronic proposal submission system. ([CARR Solicitation](#)) ♦

## Becker Appointed to Spacehab Science Advisory Council

Jeanne L. Becker, Ph.D., NSBRI Associate Director, has been appointed to the newly formed Science Advisory Council of Spacehab Incorporated, a provider of commercial space services.

The Science Advisory Council is an elite team of scientists, physicians and microgravity specialists who will provide strategic guidance and technical insight as Spacehab advances its identified microgravity processing initiatives through its new subsidiary, Spacehab Microgravity Sciences, Inc.

The scope of the Council's activities is primarily related to advising Spacehab in the identification and selection of high-priority science targets that present the most favorable conditions – including the maturity of the science, the potential market value, as well as a 'quality of life' value to the general public – for immediate development in the microgravity environment of the International Space Station National Lab. ♦

## Postdoctoral Fellowships Awarded

NSBRI awarded three Postdoctoral Fellowships for 2007-2009 to:

- Stephanie M. Carleton, Ph.D., University of Missouri-Columbia,
- Jocelyn E. Songer, Ph.D., Massachusetts Eye and Ear Infirmary, and
- Jeffrey S. Willey, Ph.D., Clemson University.

They represent NSBRI's fourth group of young scientists selected for the two-year Postdoctoral Fellowship Program. ([List of Fellows, Project Summaries and Mentors](#))

The program offers young scientists the opportunity to manage their own space-related biomedical research project while continuing to learn from an experienced faculty mentor.

Participants become a part of one of NSBRI's research teams and attend a summer institute that provides an introduction to NASA Johnson Space Center's research facilities and programs.

NSBRI solicits applications for its Postdoctoral Fellowship Program annually. ♦

## Graduate Program in Second Year

Leadership of NSBRI's Graduate Education Program in Space Life Sciences met to review first-year progress and to coordinate planning. The program is conducted jointly at Texas A&M University and at Massachusetts Institute of Technology through the Harvard-MIT Division of Health Sciences and Technology. To date, nine students have enrolled in the programs. Each program will admit two more students for Fall 2008.

Students working toward a Ph.D. at these institutions can focus on space life sciences and experience advanced courses in biomedical science and engineering, specifically as these fields relate to the space program.

Last summer, the students participated in an experiential component which included three weeks of hands-on training in their area of expertise at NASA Johnson Space Center and one week of seminars and workshops led by various NSBRI and NASA researchers and by faculty at Baylor College of Medicine (BCM).

The lead investigators at Texas A&M are Joanne Lupton, Ph.D., Nutrition, Physical Fitness and Rehabilitation Team Leader, and Nancy Turner, Ph.D. The lead investigator at MIT is Laurence Young, Sc.D., Sensorimotor Adaptation Team member. William Thomson, Ph.D., Education Program Leader (BCM), coordinates the integration and evaluation of program modules. Sonia Rahmati-Clayton, Ph.D., also at BCM, coordinates the Houston-based summer experience.

Plans for the program include the development of educational modules, coordination of efforts among faculty, implementation of specialized training for students, exchange of students between the schools, and development of a metrics for evaluation. Three web-based lectures were developed in the first year. Additional lectures have been filmed and will be produced as modules.

Additional information can be found on the program websites – [Graduate Training Program in Space Life Sciences](#) and [Bioastronautics Training Program](#). ♦

## Bone Loss in Space Published

Peter R. Cavanagh, Ph.D., D.Sc., NSBRI Bone Loss Team Leader (Cleveland Clinic), and Andrea J. Rice, M.S., edited *Bone Loss During Spaceflight*, which was published in 2007. In the book, a group of internationally recognized experts reviews the evidence for the causes of musculoskeletal changes in space and offers a range of potential countermeasures.

The book resulted from the symposium, "Bone Loss During Spaceflight: Etiology, Countermeasures, and Implications for Bone Health on Earth," organized by Cavanagh in 2005. To order the book, contact Laurie Weiss, Cleveland Clinic Scientific Publications, at [weissl2@ccf.org](mailto:weissl2@ccf.org). ♦

## Recent Publications

Baek K, Barlow AA, Allen MR, Bloomfield SA. Food restriction and simulated microgravity: Effects on bone and serum leptin. *J Appl Physiol*. 2008 Feb 14; [Epub ahead of print]. (Bone Loss Team) ♦

Baladandayuthapani V, Mallick BK, Young Hong M, Lupton JR, Turner ND, Carroll RJ. Bayesian hierarchical spatially correlated functional data analysis with application to colon carcinogenesis. *Biometrics*. 2008 Mar;64(1):64-73. (Nutrition, Physical Fitness and Rehabilitation Team) ♦

Barnes SL, Branson R, Gallo LA, Beck G, Johannigman JA. En-route care in the air: Snapshot of mechanical ventilation at 37,000 feet. *J Trauma*. 2008 Feb;64:S129-S135. (Smart Medical Systems Team) ♦

Peterson JB, Prisk GK, Darquenne C. Aerosol deposition in the human lung periphery is increased by reduced-density gas breathing. *J Aerosol Med*. 2008 Feb 25; [Epub ahead of print]. (Technology Development Team) ♦

Shibata S, Hastings JL, Prasad A, Fu Q, Okazaki K, Palmer MD, Zhang R, Levine BD. The "dynamic" Starling mechanism: Effects of ageing and physical fitness on ventricular-arterial coupling. *J Physiol*. 2008 Feb 7; [Epub ahead of print]. (Postdoctoral Fellow – Cardiovascular Alterations Team) ♦

## Accolades

**Marlene Y. MacLeish, Ed.D.**, Education and Outreach Program Senior Education Fellow (Morehouse School of Medicine), was inducted as a member of the International Academy of Aeronautics (IAA). The IAA recognizes individuals who have distinguished themselves in a branch of aeronautics science.

At the same meeting, **Jay C. Buckey, Jr., M.D.**, Technology Development Team Leader (Dartmouth College), received the Luigi Napolitano Book Award from the IAA for his book, *Space Physiology*. ♦