National Space Biomedical Research Institute Publications

Smart Medical Systems and Technology Team

Articles

Bailey, M. R., V. A. Khokhlova, O. A. Sapozhnikov, S. G. Kargl, and L. A. Crum. Physical mechanisms of the therapeutic effect of ultrasound. *Acoustical Physics* 49(4):437-464, 2003.

Bailey, M .R., J. A. McAteer, Y. A. Pishchalnikov, M. F. Hamilton, and T. Colonius. Progress in lithotripsy research. *Acoustics Today* 2(2):18-29, 2006.

Bailey, M. R., Y. A. Pishchalnikov, O. A. Sapozhnikov, R. O. Cleveland, J. A. McAteer, N. A. Miller, I. V. Pishchalnikova, B. A. Connors, L. A. Crum, and A. P. Evan. Cavitation detection during shock-wave lithotripsy. *Ultrasound Med Biol* 31(9):1245-56, 2005.

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;64:S129-S135.

Beck, G., S. Melton, and S. A. Dulchavsky. Critical care medicine in space. *Aviat Space Environ Med* 76(2):163, 2005.

Boas, D. A., G. Strangman, J. P. Culver, R. D. Hoge, G. Jasdzewski, R. A. Poldrack, B. R. Rosen, and J. B. Mandeville. Can the cerebral metabolic rate of oxygen be estimated with near-infrared spectroscopy? *Phys Med Biol* 48(15):2405-2418, 2003.

Buckey, J. C., D. A. Knaus, D. L. Alvarenga, M. A. Kenton, and P. J. Magari. Dual-frequency ultrasound for detecting and sizing bubbles. *Acta Astronaut* 56(9-12):1041-7, 2005.

Burgess S, Zderic V, Vaezy S. Image-guided acoustic hemostasis for treatment of hidden liver injuries. *Ultrasound Med Biol.* 2007 Jan;33:113-119.

Busa, B., L. M. Miller, C. T. Rubin, Y. X. Qin, and S. Judex. Rapid establishment of chemical and mechanical properties during lamellar bone formation. *Calcif Tissue Int* 77(6):386-94, 2005.

Canney MS, Bailey MR, Crum LA, Khokhlova VA, Sapozhnikov OA. Acoustic characterization of high intensity focused ultrasound fields: A combined measurement and modeling approach. *J Acoust Soc Am*. 2008 Oct;124(4):2406-20.

Charles, Jr., H. K. Electronic instrument development for applications in space biomedicine and astronaut health. *Advancing Microelectronics* 26(6):6-9, 2002.

Charles, Jr., H. K., T. J. Beck, H. S. Feldmesser, T. C. Magee, T. S. Spisz, and V. L. Pisacane. Precision bone and muscle loss measurements by advanced, multiple projection DEXA (AMPDXA) techniques for spaceflight applications. *Acta Astronaut* 49(3-10):447-450, 2001.

Charles, Jr., H. K., M. H. Chen, T. S. Spisz, T. J. Beck, H. S. Feldmesser, T. C. Magee, and B. P. Huang. AMPDXA for precision bone loss measurements on Earth and in space. *Johns Hopkins APL Technical Digest* 25(3):187-200, 2004.

Coleman CB, Allen PL, Rupert M, Goulart C, Hoehn A, Stodieck LS, Hammond TG. Novel Sfp1 transcriptional regulation of Saccharomyces cerevisiae gene expression changes during spaceflight. *Astrobiology*. 2008 Dec;8(6):1071-8.

D'Andrea, S. E., G. P. Perusek, S. Rajulu, J. Perry, and B. L. Davis. Jumping in simulated and true microgravity: response to maximal efforts with three landing types. *Aviat Space Environ Med* 76(5):441-7, 2005.

Davies, P. F. Molecular phenotypes of atherosclerosis: fingering the perpetrators. *Arterioscler Thromb Vasc Biol* 24(10):1746-7, 2004.

Davies, P. F. Multiple signaling pathways in flow mediated endothelial mechanotransduction: PYK-ing the right location. *Arterioscler Thromb Vasc Biol* 22(11):1755-1757, 2002.

Doerr, H., W. B. Murray, M. Cuttino, and T. J. Broderick. Training astronauts to manage trauma (emergencies): Integrating human patient simulation into medical operations for NASA. *Trauma Care* 16(1):26-29, 2006.

Fincke, E. M., G. Padalka, D. Lee, M. van Holsbeeck, A. E. Sargsyan, D. R. Hamilton, D. Martin, S. L. Melton, K. McFarlin, and S. A. Dulchavsky. Evaluation of shoulder integrity in space: first report of musculoskeletal US on the International Space Station. *Radiology* 234(2):319-22, 2005.

Foale, C. M., A. Y. Kaleri, A. E. Sargsyan, D. R. Hamilton, S. Melton, D. Martin, and S. A. Dulchavsky. Diagnostic instrumentation aboard ISS: just-in-time training for non-physician crewmembers. *Aviat Space Environ Med* 76(6):594-8, 2005.

Greaby R, Zderic V, Vaezy S. Pulsatile flow phantom for ultrasound image-guided HIFU treatment of vascular injuries. *Ultrasound Med Biol.* 2007 Aug;33(8):1269-76.

Grey M, Goldsten J, Maurer R, Roth D, Zeitlin C. Data acquisition for the Combined Ion and Neutron Spectrometer (CINS). *Nucl Instrum Methods Phys Res B.* 2009 Jan;267(1):139-43.

Held, R. T., V. Zderic, T. N. Nguyen, and S. Vaezy. Annular phased-array high-intensity focused ultrasound device for image-guided therapy of uterine fibroids. *IEEE Trans Ultrason Ferroelectr Freq Control* 53(2):335-48, 2006.

Jasdzewski, G., G. Strangman, J. Wagner, K. Kwong, R. Poldrack, and D. Boas. Differences in the hemodynamic response to event-related motor and visual paradigms as measured by near-infrared spectroscopy. *Neuroimage* 20(1):479-488, 2003.

Khokhlova, V. A., M. R. Bailey, J. A. Reed, B. W. Cunitz, P. J. Kaczkowski, and L. A. Crum. Effects of nonlinear propagation, cavitation, and boiling in lesion formation by high intensity focused ultrasound in a gel phantom. *J Acoust Soc Am* 119(3):1834-48, 2006.

Khokhlova TD, Canney MS, Lee D, Marro KI, Crum LA, Khokhlova VA, Bailey MR. Magnetic resonance imaging of boiling induced by high intensity focused ultrasound. *J Acoust Soc Am.* 2009 Apr;125(4):2420-31.

Kinnison, J. D., R. H. Maurer, D. R. Roth, and R. C. Haight. High-energy neutron spectroscopy with thick silicon detectors. *Radiat Res* 159(2):154-160, 2003.

Kwon D, Bouffard JA, van Holsbeeck M, Sargsyan AE, Hamilton DR, Melton SL, Dulchavsky SA. Battling fire and ice: Remote guidance ultrasound to diagnose injury on the International Space Station and the ice rink. *Am J Surg*. 2007 Mar;193(3):417-20.

Lafon C, Khokhlova VA, Kaczkowski PJ, Bailey MR, Sapozhnikov OA, Crum LA. Use of a bovine eye lens for observation of HIFU-induced lesions in real-time. *Ultrasound Med Biol.* 2006 Nov;32(11):1731-41.

Lafon, C., V. Zderic, M. L. Noble, J. C. Yuen, P. J. Kaczkowski, O. A. Sapozhnikov, F. Chavrier, L. A. Crum, and S. Vaezy. Gel phantom for use in high-Intensity Focused Ultrasound Dosimetry. *Ultrasound Med Biol*, 31(10):1383-89, 2005.

Lam H, Qin YX. The effects of frequency-dependent dynamic muscle stimulation on inhibition of trabecular bone loss in a disuse model. *Bone*. 2008 Dec;43(6):1093-100.

Li N, Ho CM. Patterning functional proteins with high selectivity for biosensor applications. *J Assoc Lab Automation*. 2008 Aug;13(4):237-42.

Lin, W., E. Mittra, Y. X. Qin. Determination of ultrasound phase velocity in trabecular bone using time dependent phase tracking technique. *J Biomech Eng* 128(1):24-9, 2006.

Luo, W., V. Zderic, S. Carter, L., and S. Vaezy. Detection of bleeding in injured femoral arteries with contrast-enhanced sonography. *J Ultrasound Med* 25:1169-1177, 2006.

Maurer, R. H., H. K. Charles Jr., and V. L. Pisacane. Advances in space technology: The NSBRI technology development team. *Radiat Prot Dosimetry* 100(1-4):479-487, 2002.

Maurer, R. H., J. D. Kinnison, and D. R. Roth. Neutron production from 200-500 MeV proton interaction with spacecraft materials. *Radiat Prot Dosimetry* 116(1-4 Pt 2):125-30, 2005.

Maurer, R. H., D. R. Roth, J. D. Kinnison, J. O. Goldsten, R. E. Gold, and R. Fainchtein. Mars Neutron Energy Spectrometer (MANES): an instrument for the Mars 2003 Lander. *Acta Astronaut* 52(2-6):405-410, 2003.

Maurer RH, Roth DR, Kinnison JD, Haggerty DK, Goldsten JO. The NSBRI/APL neutron energy spectrometer. *Johns Hopkins APL Tech Digest* 27(1):56-65,2006.

Maurer, R. H., C. J. Zeitlin, D. K. Haggerty, D. R. Roth, and J. O. Goldsten. Compact ion and neutron spectrometer (CINS) for space applications. *IEEE Nuclear Science Symposium Conference Record* N14-48:428-432, 2005.

McFarlin, K., A. E. Sargsyan, S. Melton, D. R. Hamilton, and S. A. Dulchavsky. A surgeon's guide to the universe. *Surgery* 139(5):587-90, 2006.

Mittra, E., S. Akella, and Y. X. Qin. The effects of embedding material, loading rate and magnitude, and penetration depth in nanoindentation of trabecular bone. *J Biomed Mater Res A.* 2006 Oct;79(1):86-93.

Mittra E, Rubin C, Gruber B, Qin YX. Evaluation of trabecular mechanical and microstructural properties in human calcaneal bone of advanced age using mechanical testing, muCT, and DXA. *J Biomech.* 2008;41(2):368-75.

Mittra, E., C. Rubin, and Y. Qin. Interrelationship of trabecular mechanical and microstructural properties in sheep trabecular bone. *J Biomech* 38(6):1229-37, 2005.

Mortimer, A. J., M. E. DeBakey, R. Gerzer, R. Hansen, J. Sutton, and S. N. Neiman. Life science research in space brings health on Earth. *Acta Astronautica* 54:805-812, 2004.

Mukkamala R., J. M. Mathias, T. J. Mullen, R. J. Cohen, and R. Freeman. System identification of closed-loop cardiovascular control mechanisms: diabetic autonomic neuropathy. *Am J Physiol* 276(45):R905-R912, 1999.

Mullen, T. J., R. D. Berger, C. M. Oman, and R. J. Cohen. Human heart rate variability relation is unchanged during motion sickness. *J Vestib Res* 8(1):95-105, 1998.

Naghavi, M., R. John, S. Naguib, M. S. Siadaty, R. Grasu, K. C. Kurian, W. B. van Winkle, B. Soller, S. Litovsky, M. Madjid, J. T. Willerson, and W. Casscells. pH Heterogeneity of human and rabbit atherosclerotic plaques; a new insight into detection of vulnerable plaque. *Atherosclerosis* 164(1):27-35, 2002.

Ni Q, De Los Santos A, Lam H, Qin Y- X. Assessment of simulated and functional disuse on cortical bone by nuclear magnetic resonance. *J Adv Space Res*. 2007;40(11):1703-1710.

Ouellette AL, Li JJ, Cooper DE, Ricco AJ, Kovacs GT. Evolving point-of-care diagnostics using up-converting phosphor bioanalytical systems. *Anal Chem*. 2009 Apr 15.

Owen NR, Bailey MR, Crum LA, Sapozhnikov OA, Trusov LA. The use of resonant scattering to identify stone fracture in shock wave lithotripsy. *J Acoust Soc Am*. 2007 Jan;121(1):EL41-7.

Owen, N. R., M. R. Bailey, J. Hossack, and L. A. Crum. A method to synchronize high-intensity, focused ultrasound with an arbitrary ultrasound imager. *IEEE Trans Ultrason Ferroelectr Freq Control* 53(3):645-50, 2006.

Paek, B., J. Foley, V. Zderic, F. Starr, L. E. Shields, and S. Vaezy. Selective reduction of multifetal pregnancy using high-intensity focused ultrasound in the rabbit model. *Ultrasound Obstet Gynecol* 26(3):267-70, 2005.

Passerini, A. G., D. C. Polacek, C. Shi C, N. M. Francesco, E. Manduchi, G. R. Grant, W. F. Pritchard, S. Powell, G. Y. Chang, C. J. Stoeckert Jr, and P. F. Davies. Coexisting proinflammatory and antioxidative endothelial transcription profiles in a disturbed flow region of the adult porcine aorta. *Proc Natl Acad Sci U S A* 101(8):2482-7, 2004.

Polacek, D. C., A. G. Passerini, C. Shi, N. M. Francesco, E. Manduchi, G. R. Grant, S. Powell, H. Bischof, H. Winkler, C. J. Stoeckert Jr, and P. F. Davies. Fidelity and enhanced sensitivity of differential transcription profiles following linear amplification of nanogram amounts of endothelial mRNA. *Physiol Genomics* 13(2):147-156, 2003.

Poliachik, S. L., W. L. Chander, R. J. Ollos, M. R. Bailey, and L. A. Crum. The relation between cavitation and platelet aggregation during exposure to high-intensity focused ultrasound. *Ultrasound Med Biol* 30:261-269, 2004.

Qin YX, Lam H. Intramedullary pressure and matrix strain induced by oscillatory skeletal muscle stimulation and its potential in adaptation. *J Biomech*. 2009 Jan 19;42(2):140-5.

Rabkin BA, Zderic V, Crum LA, Vaezy S. Biological and physical mechanisms of HIFU-induced hyperecho in ultrasound images. *Ultrasound Med Biol*. 2006 Nov;32:1721-1729.

Sapozhnikov OA, Maxwell AD, MacConaghy B, Bailey MR. A mechanistic analysis of stone fracture in lithotripsy. *J Acoust Soc Am.* 2007 Feb;121(2):1190-1202.

Sargsyan AE, Dulchavsky AG, Adams J, Melton S, Hamilton DR, Dulchavsky SA. Ultrasound detection of simulated intra-ocular foreign bodies by minimally trained personnel. *Aviat Space Environ Med.* 2008 Jan;79(1):58-61.

Scadeng M, Rossiter HB, Dubowitz DJ, Breen EC. High-resolution three-dimensional magnetic resonance imaging of mouse lung in situ. *Invest Radiol*. 2007 Jan;42(1):50-7.

Soller, B. R., M. E. Cabrera, S. M. Smith and J. P. Sutton. Smart medical systems with application to nutrition and fitness in space. *Nutrition* 18(10):930-936, 2002.

Soller BR, Hagan RD, Shear M, Walz JM, Landry M, Anunciacion D, Orquiola A, Heard SO. Comparison of intramuscular and venous blood pH, PCO(2) and PO(2) during rhythmic handgrip exercise. *Physiol Meas*. 2007 Jun;28(6):639-49.

Soller, B. R., P. O. Idwasi, J. Balaguer, S. Levin, S. A. Simsir, T. J. Vander Salm, H. Collette, and S. O. Heard. Noninvasive, near infrared spectroscopic-measured muscle pH and PO_2 indicate tissue perfusion for cardiac surgical patients on cardiopulmonary bypass. *Crit Care Med* 31(9):2324-2331, 2003.

Soller BR, Yang Y, Soyemi OO, Ryan KL, Rickards CA, Walz JM, Heard SO, Convertino VA. Noninvasively determined muscle oxygen saturation is an early indicator of central hypovolemia in humans. *J Appl Physiol*. 2008 Feb 8;104:475-481.

Soyemi, O. O., M. R. Landry, Y. Yang, P. O. Idwasi, and B. R. Soller. Skin color correction for tissue spectroscopy: demonstration of a novel approach with tissue-mimicking phantoms. *Appl Spectrosc* 59(2):237-44, 2005.

Strangman, G., D. A. Boas, and J. P. Sutton. Non-invasive neuroimaging using near-infrared light. *Biol Psychiatry* 52(7):679-693, 2002.

Strangman, G., J. C. Culver, J. H. Thompson, and D. A. Boas. A quantitative comparison of simultaneous BOLD fMRI and NIRS recordings during functional brain activation. *Neuroimage* 17(2):719-731, 2002.

Strangman, G., M. A. Franceschini, and D. A. Boas. Factors affecting the accuracy of near-infrared spectroscopy concentration calculations for focal changes in oxygenation parameters. *Neuroimage* 18(4):865-879, 2003.

Strangman, G., J. H. Thompson, M. M. Strauss, T. H. Marshburn, and J. P. Sutton. Functional brain imaging of a complex navigation task following one night of total sleep deprivation: A preliminary study. *J Sleep Res* 14(4):369-75, 2005.

Strauss, M. M., N. Makris, I. Aharon, M. G. Vangel, J. Goodman, D. N. Kennedy, G. P. Gasic, and H. C. Breiter. fMRI of sensitization to angry faces. *Neuroimage* 26(2):389-413, 2005.

Sutton, J. P. and I. Jamieson. Reconfigurable networking for coordinated multi-agent sensing and communications. *Inf Sci (Ny)* 148(1-4):103-111, 2002.

Vaezy S, Zderic V. Hemorrhage control using high intensity focused ultrasound. *Int J Hyperthermia*. 2007 Mar;23(2):203-11.

Vaezy S, Zderic V, Karmy-Jones R, Jurkovich GJ, Cornejo C, Martin RW. Hemostasis and sealing of air leaks in the lung using high-intensity focused ultrasound. *J Trauma*. 2007 Jun;62(6):1390-5.

Wroe AJ, Rosenfeld AB, Cornelius IM, Prokopovich D, Reinhard M, Schulte R, Bashkirov V. Silicon microdosimetry in heterogeneous materials: simulation and experiment. *IEEE Trans Nuc Sci*. 2005;NS-52,N6:2591-2596.

Xia, Y., W. Lin, and Y. Qin. The influence of cortical end-plate on broadband ultrasound attenuation measurements at the human calcaneus using scanning confocal ultrasound. *J Acoust Soc Am*, 118 (3), Part 1:1801-1807, 2005.

Xia Y, Lin W, Qin YX. Bone surface topology mapping and its role in trabecular bone quality assessment using scanning confocal ultrasound. *Osteoporos Int*. 2007 Jul;18(7):905-13.

Yang, Y., M. R. Landry, O. O. Soyemi, M. A. Shear, D. S. Anunciacion, and B. R. Soller. Simultaneous correction of the influence of skin color and fat on tissue spectroscopy by use of a two-distance fiber-optic probe and orthogonalization technique. *Opt Lett* 30(17):2269-71, 2005.

Yang, Y., L. Shoer, O. O. Soyemi, M. R. Landry, and B. R. Soller. Removal of analyte-irrelevant variations in near-infrared tissue spectra. *Appl Spectrosc* 60(9):1070-7, 2006.

Yang, Y., O. O. Soyemi, M. R. Landry, and B. R. Soller. Influence of a fat layer on the near infrared spectra of human muscle: quantitative analysis based on two-layered Monte Carlo simulations and phantom experiments. *Opt Express* 13(5):1570-79, 2005.

Yang Y, Soyemi OO, Landry MR, Soller BR. Noninvasive in vivo measurement of venous blood pH during exercise using NIR Reflectance Spectroscopy. *Applied Spectroscopy*. 2007 Feb;61(2):223-229.

Yang Y, Soyemi OO, Scott PJ, Landry MR, Lee SM, Stroud L, Soller BR. Quantitative measurement of muscle oxygen saturation without influence from skin and fat using continuous-wave near infrared spectroscopy. *Opt Express*. 2007 Oct 17;15(21):13715-30.

Zderic V, Brayman AA, Sharar SR, Crum LA, Vaezy S. Microbubble-enhanced hemorrhage control with high intensity focused ultrasound. *Ultrasonics*. 2006 Dec;45(1-4):113-120.

Zderic V, Foley J, Luo W, Vaezy S. Prevention of post-focal thermal damage by formation of bubbles at the focus during high intensity focused ultrasound therapy. *Med Phys.* 2008 Oct;35(10):4292-9.

Zderic, V., A. Keshavarzi, M. L. Noble, M. Paun, S. R. Sharar, L. A. Crum, R. W. Martin, and S. Vaezy. Hemorrhage control in arteries using high-intensity focused ultrasound: a survival study. *Ultrasonics* 44(1):46-53, 2006.

Zderic V, O'Keefe GE, Foley JL, Vaezy S. Resection of abdominal solid organs using high-intensity focused ultrasound. *Ultrasound Med Biol.* 2007 Aug;33(8):1251-8.

Zeitlin C, Maurer R, Roth D, Goldsten J, Grey M. Development and evaluation of the Combined Ion and Neutron Spectrometer (CINS). *Nuclear Instrum Meth Phys Res Sec B: Beam Interactions with Materials and Atoms* 2009 Jan;267(1):125-38.

Zheng S, Lin JC-H, Kasdan HL, Tai YC. Fluorescent labeling, sensing, and differentiation of leukocytes from undiluted whole blood samples. *Sens Actuators B Chem*. 2008 Jun;132:558-567.

Zheng S, Liu M, Tai YC. Micro Coulter counters with platinum black electroplated electrodes for human blood cell sensing. *Biomed Microdevices.* 2008 Apr;10(2):221-31.

Zheng S, Liu JQ, Tai YC. Streamline based microfluidic device for erythrocytes and leukocytes separation. *J MEMS*. 2008 Aug;17(4):1029-1038.

Zheng S, Nandra MS, Shih CY, Li W, Tai YC. Resonance impedance sensing of human blood cells. *Sens Actuators A: Phys* 2008 Jul-Aug;145-146:29-36.