Effect of Novel Nanoscale Energy Patches on Spectral and Nonlinear Dynamic Features of Heart Rate Variability Signals in Healthy Individuals during Rest and Exercise

Nazeran, H. Chatlapalli, S. Krishnam, R.
Department of Electrical and Computer Engineering, The University of Texas at El Paso, El Paso Texas, USA. E-mail: Nazerans@aol.com; School of Informatics and Engineering, Flinders University of South Australia, Adelaide, Australia.;

This paper appears in: **Engineering in Medicine and Biology Society, 2005. IEEE-EMBS 2005. 27th Annual International Conference of the**
Publication Date: 01-04 Sept. 2005
On page(s): 5563- 5567
ISBN: 0-7803-8741-4
Posted online: 2006-04-10 08:29:46.0

Abstract
LifeWave energy patches are novel nanoscale semiconducting biomolecular antennas, that when placed in the oscillating bioelectromagnetic field of the body, resonate at frequencies in unison with certain biomolecules in the cells and signal specific metabolic pathways to accelerate fat metabolism. As a consequence of accelerated fat burning more cellular energy becomes readily available to support all bodily energy-consuming functions. Heart rate variability refers to the beat-to-beat variation in heart rate (HR) and is modulated largely by the autonomic nervous system via changes in the balance between parasympathetic and sympathetic influences. Since short-term variations in HR reflect sympathetic nervous activity, they provide useful non-invasive markers for assessing autonomic control under various physiologic states and conditions. To evaluate the effect of LifeWave energy patches on HRV signals, pilot data from healthy volunteers were collected under three different conditions during rest and exercise using a BIOPAC system. The HRV signal was derived from preprocessed ECG signals using an Enhanced Hilbert Transform (EHT) algorithm with built-in missing beat detection capability for reliable QRS detection. Autoregressive (AR) modeling of the HRV signal power spectrum was achieved and different parameters from power spectrum as well as approximate entropy were calculated for comparison. Poincaré plots were then used as a visualization tool to highlight the variations in HRV signals before and after exercise under normal conditions and under the influence of placebo and energy patches.