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INFLUENCE OF AMBIENT TEMPERATURE ON CENTRAL AND PERIPHERAL IMPEDANCE MEASUREMENTS OF THE HUMAN BODY

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Abstract

Bioimpedance analysis has already proved its utility in many fields of medical research (cardiovascular and respiratory systems, body composition, muscle etc). This method is easy to implement and could be used for continuous noninvasive monitoring. Several factors, environmental temperature being one of the most significant, strongly influence the accuracy of the measurements. Changes in surface skin temperature produced by changes in ambient temperature are related with changes in blood flow and skin impedance. Consequently, the variability of the skin impedance change is responsible for some errors in segmental measurements. Measurements including body parts more distant from the torso seem to be more affected. In this paper we measure the impedance (central or associated with a specific segment) of the body, on healthy subjects, under expectable changes in environment temperature (15-30 °C). Additionally, we present a genuine device, designed and built in order to measure this impedance. An oscillator generates a constant current with adjustable frequency between 5 kHz and 150 kHz. The circuit was validated by testing its current output over a wide frequency range and by comparing the measured values of impedance across a test circuit with the expected values. Results indicate that skin impedance changes are influenced by ambient temperature. Measurements show a relative variation between 2% and 12% in different parts of the body. These changes may lead to significant changes in blood flow in those sections, with repercussions on the body. For people working in tough conditions it is also necessary to monitor physiological parameters by non-invasive methods in order to prevent possible accidents.

Key words: bioimpedance, blood flow, frequency, resistance, temperature

Received: December, 2010; *Revised final:* March, 2011; *Accepted:* April, 2011

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