БІОМЕДИЧНІ ВИМІРЮВАННЯ ТА ПРИЛАДИ

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IN VIVO THERMAL EFFECTS AT BIOLOGICAL ACTIVE POINTS

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Biological active points (BAP) i.e. acupuncture points (AP) placed along body meridians were excited using electrical stimulus. The aim was to find out the physical peculiarity of the human body at BAP. Their temperature has been measured with non-contact, radiation method during experiment. Trial included measurements at stimulated points placed on the different meridians. Results revealed changes of BAP temperature evoked by electrical excitation.

Introduction. Traditional Orient medical techniques have their recovery and as an alternative medicine take part in the development of medicine and healthy style of live. Shiatsu massage and acupuncture have been offering significant results in diagnosis and treatment. Nevertheless the Eastern therapies evoke many controversies in the world of modern, scientific medicine because the description of mechanism of their action is not based on the scientific rules. The aim of the paper is to find out the physical parameters of the skin at BAP, which would characterise the phenomenon of acupuncture points (AP) and their ability for the diagnosis and the healing.

Thermal characteristics based on temperature measurement were used because acupuncture deals with energetic condition of organism.

Acupuncture points, according to Chinese medicine, control and regulate a human's health condition and fettle by bioenergy distribution. Originate in internal organs and systems of organism the bioenergy "chi" combines with the breath and circulates in the body along paths called meridians. The meridians form a meridian systems and co-operate together to assure the flow and distribution of "chi" in the body. System of meridians controls all multilevel network that connects the various regions of the body, including the surface, with the internal functions of organism. The interwoven system of meridians and possibilities for diagnosis and treatment, they offer, are called meridian theory. When an internal organ is not balanced energetically, related acupuncture points may become irritated, providing a basis for diagnosis. For the treatment the point on the skin is stimulated using for example: needle insertion, pressure, suction, or heat [1].

In presented tests safety reasons (no needle) caused that electric stimulation was used (electropuncture). Selected BAPs were excited while their temperature was measured before, during, directly after and 30min after for to study thermal response. Results of temperature measurements both would throw light on the peculiarity of AP and explain the appearance of energetic contact at these points, which is actually practised.

Method and Materials. Correlates between temperature reaction at AP and stimulus at AP were investigated using a radiation IR pirometer for temperature measurement. A stimulus (low electric current) and a reaction (heat flux change over an AP area) had different physical nature. Changes of temperature were a measure of organism's response.

The experiments presented were performed over the points of Yang meridian (Li7, Si6, Tw7) and the Yin meridian (L6, H6, P4) of 10 volunteers over the course of 30 experimental trials. Measurements were taken: before, during, directly after, and 30minutes after the stimulation (Table1) [2].

In the experiments an electronic device designed for AP localisation and self-treatment was used for finding and stimulation. Its I_{max} = 40mA on R_o =500Ω. It has been applied for ca 30s at the middle range of output current.

Results. Examples of obtained results are presented on the figures below [2].

Table 1

Measurement program

Kind of measurement	AP measured	time of measurement	Span of test
Effects of electric current stimulation	Lunge (L6) Heart (H6) Pericardium (P4) Large Intestine(Li7) Small Intestine(Si6) Triple Warmer(Tw7) Neutral point (N)	Before, During Directly after 30 minutes after	Every day for 30 days

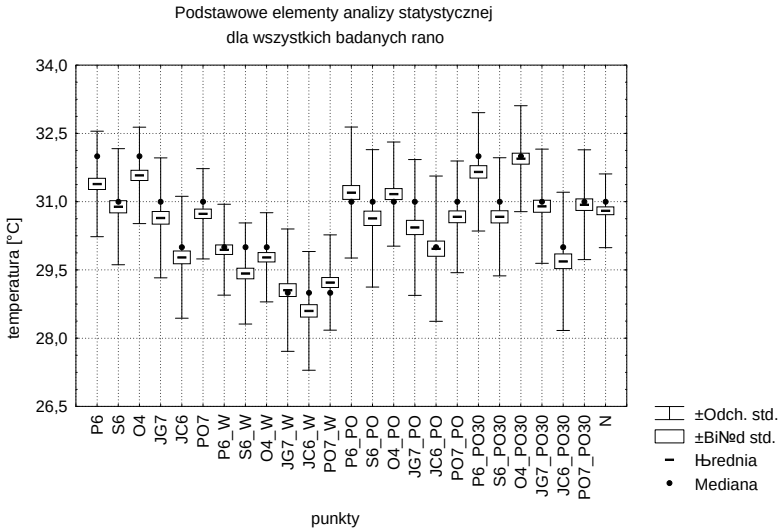

Fig. 1. Statistical analysis of measurements taken in the morning (legend: P6= L6, S6=H6, O4= P4, JG7=Li7, JC6= Si6, PO7= Tw7, N= neutral; indices: W means during excitation, PO means directly after and PO30 means 30 minutes after)

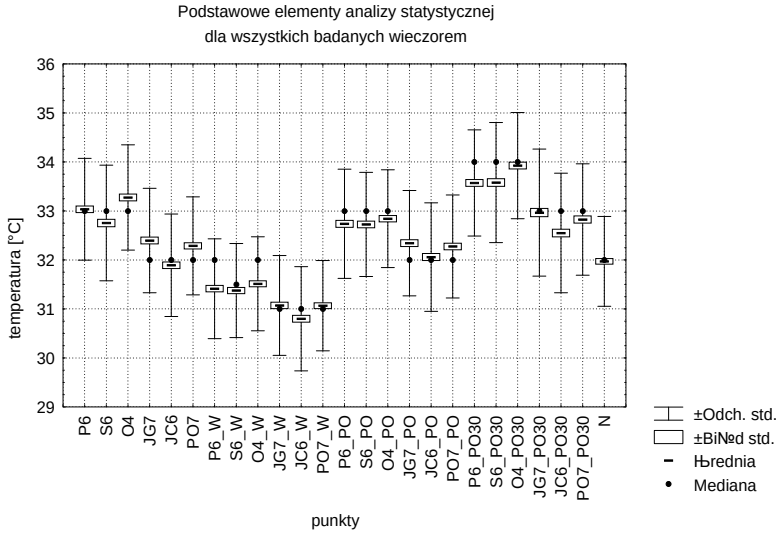

Fig.2. Statistical analysis of measurements taken in the evening (legend: P6= L6, S6=H6, O4= P4, JG7=Li7, JC6= Si6, PO7= Tw7, N=neutral; indices: W means during excitation, PO means directly after and PO30 means 30 minutes after)

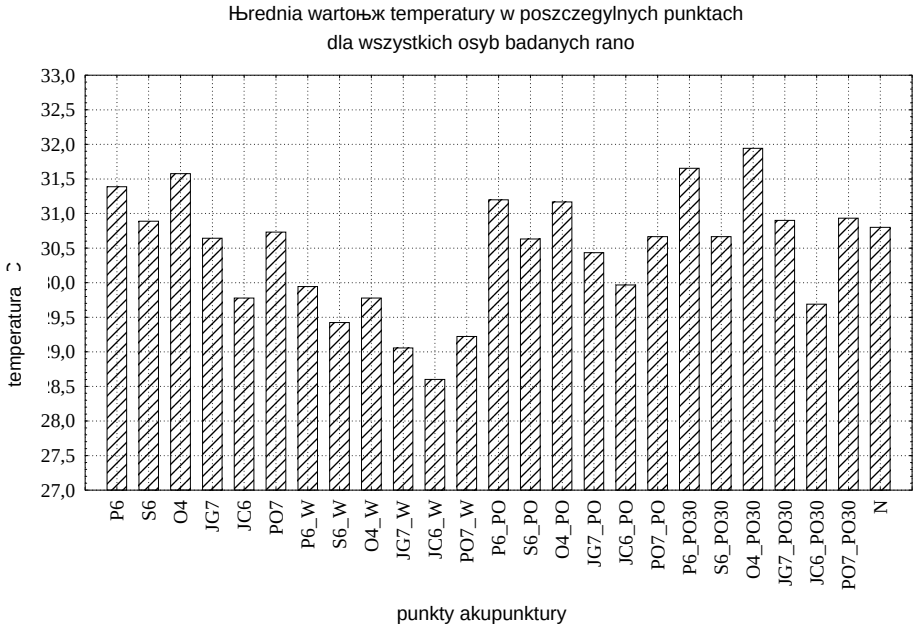

Fig.3. Mean temperatures of 30–days course (morning)
(legend: P6= L6, S6=H6, O4= P4, JG7=Li7, JC6= Si6, PO7= Tw7, N=neutral;
indices: W means during excitation, PO means directly after and PO30 means 30 minutes after)

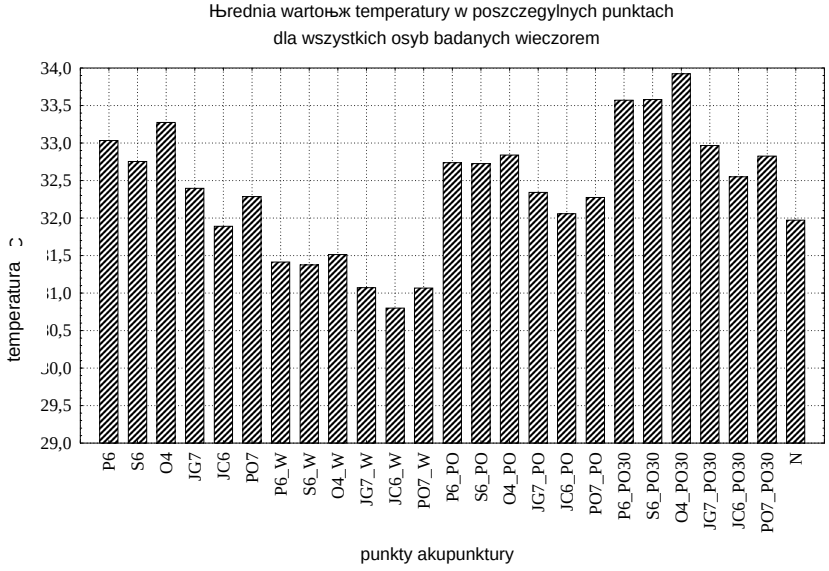

Fig.4. Mean temperatures of 30–days course (evening)
(legend: P6= L6, S6=H6, O4= P4, JG7=Li7, JC6= Si6, PO7= Tw7, N=neutral;
indices: W means during excitation, PO means directly after and PO30 means 30 minutes after)

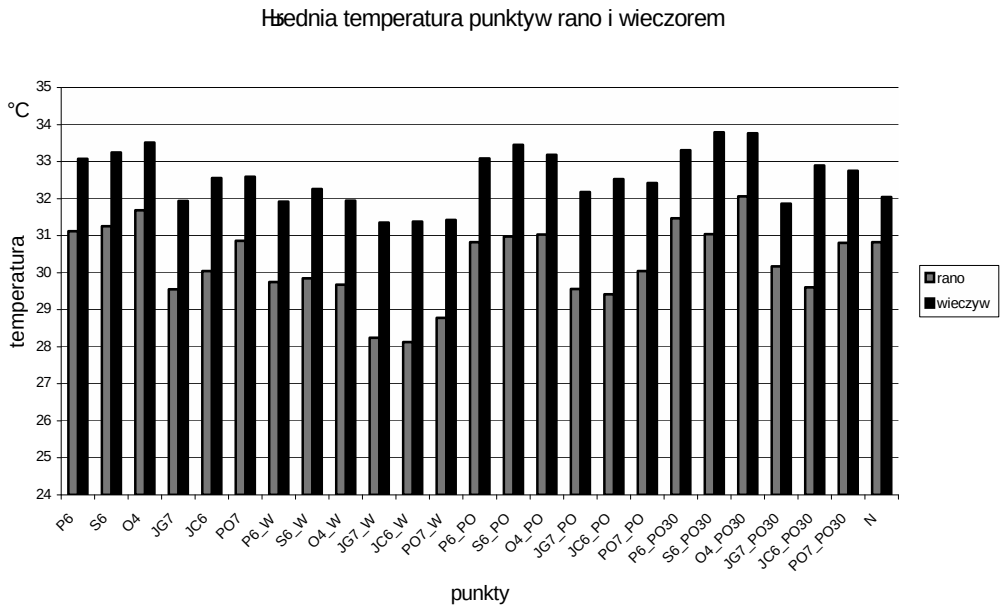

Fig.5 Mean temperatures of 30-days course: in the morning and in the evening (legend: P6= L6, S6=H6, O4= P4, JG7=Li7, JC6= Si6, PO7= Tw7, N=neutral; indices: W means during excitation, PO means directly after and PO30 means 30 minutes after)

Discussion. The effects of stimulation are seen most evidently 30 minutes after it. Generally mean temperatures at all AP measured 30 minutes after the end of excitation is higher then in beginning of experiment. Nevertheless it may be seen that mean temperature at particular AP points has been dropped during stimulation and than it has been increasing again. Moreover there is the significant difference between mean temperature value in the morning and in the evening but the ratio of these values is similar. No difference is seen between reaction on Yang and Yin meridians.

Conclusions. It is worth noting that experimental data obtained are useful start point for the analysis of skin's response to a stimulus [3]. In presented case it was an electrical stimulus but a needle insertion therapy or pressure may be considered as well. The out comes of further studies would be important in Shiatsu massage, non-conventional therapy and rehabilitation. While the characteristic of skin's electrical parameters have been the subject of study under a variety of conditions, the phenomena of energetic response are still far from being understood.

1. Tsuei J.J., The science of acupuncture – Theory and practice, IEEE Eng. in Medicine and Biology Magazine .1996.15, No3, pp. 52-57. 2. Drabik B., Badanie parametrów temperaturowych organizmu, praca dyplomowa magisterska, Rzeszów 2003. 3. Dziuban E. Skin Temperature Properties at Acupuncture points, IFMBE Proceedings, 4. Medicon 2001, IX Mediterranean Conference on Medical and Biomedical Engineering and Computing,12-15 June 2001, Pula, Croatia, pp 317-319