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Meridians in acupuncture and infrared imaging

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Summary The meridians in acupuncture are hypothesized to be made up of polarized molecules. Quantum excitations, quasi-particles and others are assumed to be the media of communication between different parts of the body connected by meridians. Infrared pictures are taken to depict the effect of acupuncture on one acupoint of a meridian to a far away pain area. © 2001 Harcourt Publishers Ltd

HYPOTHESIS

Acupuncture has been around for many thousands of years in China and has achieved good results in both man and animals. It has also recently begun to gain wide acceptance in the West. However, despite many scientific studies, it has still failed to achieve the recognition it needs within mainstream orthodox scientific circles. Many studies over the past 40 years have shown that electric conductivity on acupuncture points (1–4) is lower than that on neighboring points. One of the most recent studies has been carried out using functional magnetic resonance imaging (fMRI); it has reported the correlation between vision acupoints in the foot and corresponding brain cortices (5). When acupuncture stimulation is performed on a vision-related acupoint (located on the lateral aspect of the foot), fMRI shows activation of the occipital lobes. Stimulation of the eye using direct light results in similar activation in the occipital lobes when visualized by fMRI.

Two main questions need to be answered in a modern scientific way:

1. What are meridians?
2. What is the *qi* that is supposed to circulate around the meridians?

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The theory behind acupuncture is that the body has a system of meridians which channel some kind of substance, energy, or information that has been vaguely called *qi* in the literature. Unfortunately, so far, when one dissects the human body, one does not find any substance that distinguishes the meridians from their surrounding tissues, quite unlike other human systems such as the nerve system or the blood system. Therefore the most likely explanation is that meridians are made up of same ordinary molecules that make up other living materials surrounding them with the exception that they are more ordered. These ordered molecules are neutral but electrically polarized. This provides the natural explanation on the concept of the balance of yin and yang in Chinese medicine as the neutralization of negative and positive charges in electricity. Our hypothesis is then as follows:

> The meridians are made up of electrically polarized molecules. On the meridians there are quantum phenomena such as excitations, quasi-particles, etc. that account for significant properties of meridians.

These polarized molecules line up their polarity to form bigger clusters. Specifically, they are most likely water molecules that group together to form water clusters, which have permanent electric dipole moment. These water clusters then line up together to form the meridians. It has been suggested for a long time that water plays

a very active role in the living state of the human body. Albert Szent-Gyorgyi (*6*) was the first prominent scientist to point out many years ago that water may actively participate in the function of the human body. More recently, in particular, stable water clusters have been described which are created during a phase transition by the addition of a very small amount of salt (*7*) to pure water. These stable water clusters, which have permanent electric dipole moment and oscillate at very specific frequencies, may be an essential ingredient in the function of life (*8*). Such stable water clusters have been shown to exist outside the human body and have very specific physical, chemical, and biological properties (*9*,10). They have electric dipole which has a net negative charge on one end and a net positive charge on the other end.

The traditional view that *qi* circulates around the meridians can be explained mainly by quantum phenomena.

How do we test such a hypothesis? A quantitative and objective test would be to prove that there is communication via a meridian between the point where the needle is inserted and the part of the body where acupuncture is supposed to work. We start from the pain area of a patient and find the meridian that goes through the area, and put a single needle in some acupoints lying further away on the same meridian. The infrared imaging method can capture this process in motion.

INFRARED IMAGING

Infrared imaging techniques have been used extensively for many years in medicine (11–15). The technique is particularly suitable for Chinese medicine, because the meridians are there to connect the surface with internal organs. The digital infrared imaging system we use is a Meditherm2000, which has a temperature resolution of 0.01°C and a spatial resolution better than 1 mm. A single detector maintained at 13°K measures all the infrared radiation at all points of the body. There is continuous calibration, and absolute temperature is reliable. We have treated more than 30 patients with pain using acupuncture. The patient is seen by an acupuncturist, who makes the diagnosis according to patient's symptoms and hot spots shown on the infrared picture and then decides into which acupuncture point to insert the needle. Only one needle is used, and the acupoint chosen is one at a distance from the pain area to ensure that the effect is not local and communication is required through the chosen meridian from the acupoint to the pain area. The infrared camera continuously monitors the hot spots. A difference in the temperature of the hot spots of the pain area is observed within a minute of the insertion of the needle in the right acupoint. The temperature generally becomes stable in 10–30 minutes, and the reduction of temperature for most patients we observe is in the range of 0.5°C to 2°C.

We have selected three cases with three different patients and present their more detailed reports. Since infrared imaging is sensitive, we require patients to lie on a bed as quietly as possible to receive treatment. The room is kept at constant temperature of 21°C, so that there is a minimum of change in the environment and physiological activity during the 30 minutes of observation. The thermal graphs for the three different patients selected here are shown in Figures 1–3. The numerical values of the maximum temperature of different regions on the surface of the three patients are shown in Tables 1–3.

Control is always difficult for acupuncture treatment because it is difficult to simulate the effect of a needle without a needle. We use different pain areas of the same

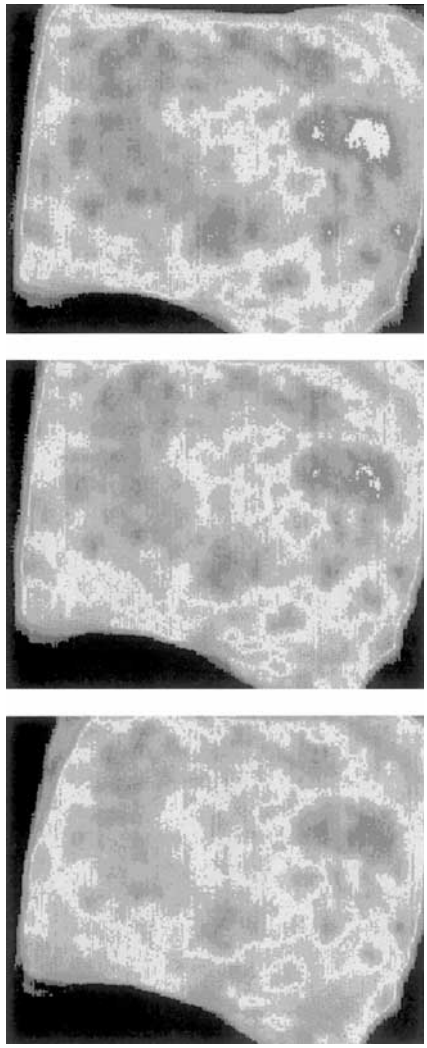

Fig. 1 The patient suffered stomach pain. The acupuncture point was SP6, which is far away from the stomach region.The color code is white hottest, then red, orange, yellow, green, and blue. A drop of maximum temperature from before treatment (top) to 2 minutes after treatment (middle), and then to 10 minutes after treatment (bottom) can be seen in the disappearance of the white region.

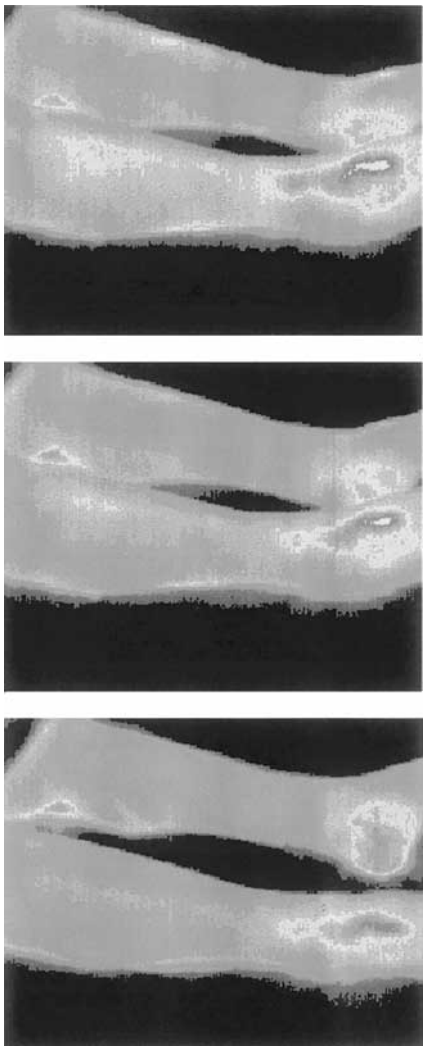

Fig. 2 The patient complained about pain in the right leg. Acupuncture was at the stomach meridian, ST36. The top picture is before treatment. The middle picture is 5 minutes after treatment, and the bottom picture is after 35 minutes of treatment. The temperature of both legs dropped by 0.4°C to 1.0°C on different regions of both legs. The patient did not complain of the same pain a week later.

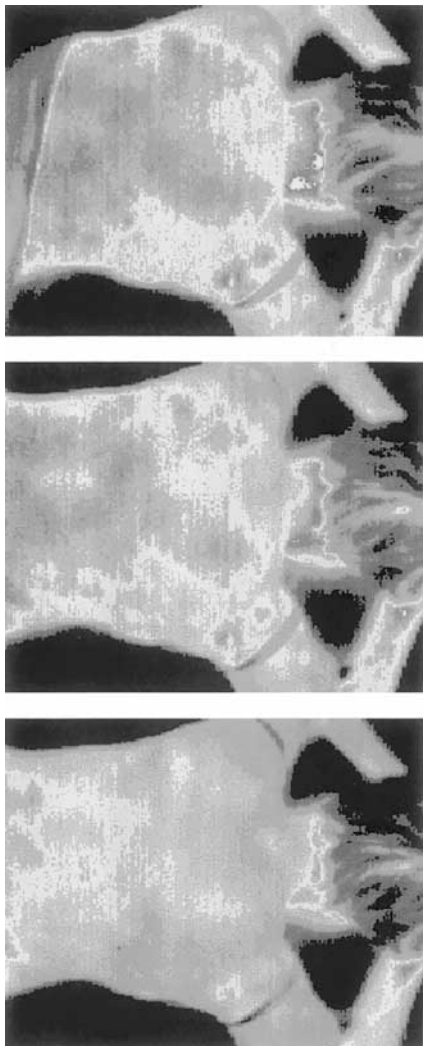

Fig. 3 The patient complained about back pain. The acupuncture point was at D14. All pain was relieved. The top picture is before treatment. The middle picture is after 1 minute of treatment, and the bottom picture is after 10 minutes of treatment. The maximum temperature region (white) disappeared after 10 minutes.

patient as control. A pain area which is not connected by a meridian to the acupoint would not be reduced in temperature, whereas in a pain area connected by a meridian to the acupoint, temperature reduction would be observed during treatment. This is shown in Figures 4 and 5.

DISCUSSION

To search for clean physical evidence of water clusters and quantum excitations along the meridians inside a human body is not simple, because of the complexity of the human structure. For example, the chemical reaction of oxidation of carbon hydrates in a test tube is quite simple: oxygen in the air combines with carbon hydrate to produce carbon dioxide and water with the release of excess heat. There is nothing else. However, chemical reactions of oxidation of carbon hydrate inside the human body are far more complicated, involving enzymes and many intermediate steps, and part of the heat energy is often converted into mechanical energy. We use what we learn outside human body and search for similar reactions inside. We shall do the same here for meridians. Properties of water clusters are studied outside the human body, and evidence of such water clusters is looked for inside humans. Qualitatively there are many features of water clusters that fit in to the traditional view of meridians. These water clusters have permanent dipole moment, which means that they have an excess of positive

Table 1 Maximum temperature (°C) of different regions of the stomach (Fig. 1) after treatment with acupuncture at SP6*

Time	Lower left	Lower right	Upper left	Upper right
Before treatment	35.41	34.99	35.05	35.05
2 minutes after	35.13	34.84	34.78	34.72
10 minutes after	35.05	34.57	34.63	34.57
Temperature difference	−0.36	−0.42	−0.42	−0.48

*SP is situated at the lower inside leg, quite far from the stomach region.

Table 2 Maximum temperature (°C) of different regions of the two legs (Fig. 2) after acupuncture treatment at ST36*

Time	Upper left leg, inside	Lower left leg, inside	Upper front right leg	Joint at the lower front right leg
Before treatment	32.63	32.50	32.37	34.21
5 minutes after	33.09	32.57	31.84	34.08
35 minutes after	33.06	33.19	31.35	33.71
Temperature difference	0.43	0.69	−1.02	−0.50

*ST36 belongs to the Stomach meridian, which does not pass through the inside of the leg.

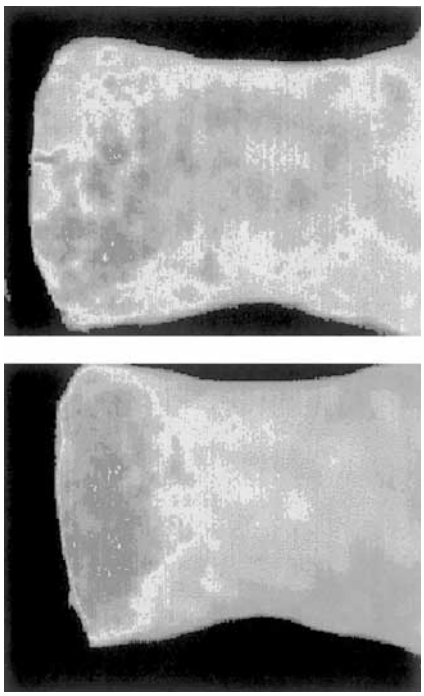

Fig. 4 This is the same patient as in Figure 3. The acupuncture at D14 does not treat the lower back region, so the condition of the lower back can serve as a control. The top picture is before treatment, and the bottom picture is after treatment. The maximum temperature of the upper part of the back changes by −1.48°C as tabulated in Table 3, but the maximum temperature of the lower part of the back only changes by −0.16°C (from 36.52°C to 36.36°C).

Table 3 Temperatures (°C) of different regions of the upper back (Fig. 3) after treatment with acupuncture at D14

Time	Left neck	Right neck	Right shoulder	Right hand
Before	35.68	36.2	35.46	35.81
1 minutes after	35.25	35.75	35.52	35.81
10 minutes after	34.51	34.72	34.37	35.50
Temperature difference	−1.17	−1.48	−1.09	−0.3

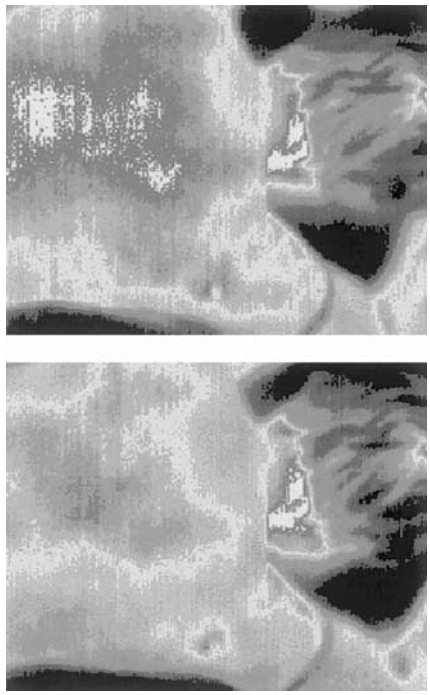

Fig. 5 The patient complained of back pain, and was treated with acupuncture at SI3, which is located in the hand. The back pain was relieved. The maximum temperature of the back reduces from 35.01°C before treatment (upper picture) to 34.11°C (bottom picture), a decrease of −0.9°C. The neck is unaffected by the small intestine meridian, and the maximum temperature at the top picture was 35.22°C, and the temperature at the bottom picture was 35.32°C, so an unrelated pain region can serve as a control in testing the meridian theory.

charges on one end and negative charges on the other end. Positive and negative charges correspond to yin and yang. The balance of yin and yang basically means the necessity to balance charges, which corresponds to the basic law of electricity for the body to remain neutral. The conductivity at the acupuncture point is lower than in the surrounding area because the water clusters in the meridians conduct better than proteins. When the water clusters are misaligned, this will make excitation harder, *qi* harder to propagate, and the person may feel pain. Quantitatively, there are three properties that suggest meridians may be composed of water clusters: dipole potential, resonance frequency, and polarization of photons.

Dipole potential

It has been measured that solutions which contain these water clusters have an electromagnetic force (emf) in the range of 10 mV to 100 mV, depending on the type of water clusters (11–15). This emf is produced because the permanent electric dipole moment of water clusters are lined up and an electric field is emitted from the electric dipole. This is quite similar to magnets, which have magnetic dipoles. When the magnets are lined up, they will produce a magnetic field which is measurable. It is well known also that at the acupuncture point the emf is different from the neighboring skin, having an additional emf in the order of 10 mV. For a *qi* gong master the effect is particularly strong, and in some cases the emf can go up to 100 mV (16).

Resonance frequencies

Solutions that contain these water clusters have been found to exhibit very low frequencies in conductivity oscillation measurements, ranging from 0.1 Hz to 1 Hz. This can be attributed to the rotational frequency of very heavy water clusters. Such low frequency has been found useful in acupuncture treatment. There are many low-frequency pulse therapeutic devices in the marketplace, in effect electro-acupuncture instruments. The general opinion of buyers suggest that such low-frequency pulse electro-acupuncture devices have a good curative effect. The frequency of such devices ranges from 1 Hz to 16 Hz. It is not clear whether such tests satisfy the highest international scientific standard in medicine; however, it is a good indication that low frequency resonances may indeed play a role in the function of meridians. This low frequency effect may originate from the existence of water clusters in the meridians.

Polarization of photons

The thermal radiation from the human surface is well known to be very close to a black body radiation, and the polarization of the radiation is random. However, the radiation from a dipole is polarized with a magnetic component perpendicular to the direction of the dipole (18). Therefore, if the infrared radiation does come from dipole oscillation of water clusters it is polarized. If linear polarized infrared radiation from the acupuncture point were detected whereas there was no such polarization is observed at other places, it would be definite evidence for the existence of structures with permanent dipole moment in the acupuncture points. We strongly urge the measurement of such polarization in any electromagnetic radiation emitted from the human body, and in particular in thermal radiation.

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16. For instance, one device claimed to pass trial clinical applications in Shugang Hospital attached to Shanghai College of Traditional Chinese Medicine, Yueyang Hospital, and the Affiliated Changzheng Hospital of the Second Military Medical University, Shanghai Baogang Hospital. It has been examined and verified by the Medical Device authorities in Charge with a Shanghai Pharmaceutical Device Supervision Approval No. 226022 to have curative effect.
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