



A SIMPLE EXPLANATION

What are you doing?

I'm supporting the healing of an injury by stimulating known acupuncture points with red light.

How does that support healing?

The explanation will draw together a range of scientific principles from the disciplines of mathematics, physics, biochemistry and bioenergetics. Basically, to appreciate the therapy we must have a basic understanding of skin, acupuncture and light.

SKIN

The skin of any organism has a bioelectric capability. Bioelectric sensing systems exist in fish, reptiles, monotremes, mammals and man, and are built into their skins or outer coverings.

Skin, the largest organ of the body, and is 16% of total body weight, has three main functions; protective, sensory and thermoregulatory. The last two functions are controlled by thalamus and hypothalamus. Under the skin is a subcutaneous connective tissue comprised of collagen, the largest protein type in the body. Collagen has both a piezoelectric (responds to change in pressure) and a pyroelectric (responds to changes in temperature) component.

Anyone can change the electrical potential of the skin by touching it. Touch the skin and a well is formed. Tissue under compression is negatively charged and under tension is positively charged. So when touched, the well created is negative at the bottom and positive at the top edges. This relative difference is registered electrically by collagen. This is how a body recognises whether the touch was by a soft point (a finger), a sharp point, a gentle intrusion or a severe intrusion into the skin.

When tissue is cut, again the bottom of the wound is negatively charged and top positively charged. The negative charges provide the galvanotaxis for the fibroblasts to heal the wound. The top charges attract phagocytes to protect the wound from infection.



ACUPUNCTURE

Acupuncture is a therapy which stimulates healing through the properties of the skin.

People have used acupuncture for healing people and animals, across the globe throughout history. There is significant knowledge of both intradermal (Bian stones, fish bones, bamboo splinters, silver, gold and stainless steel needles, flower drums, seven star hammers) and external systems (massage, cupping, moxibustion).

Acupuncture is conceptual; it does not exist and is not scientific. Just as the Equator is conceptual, it does not actually exist, yet something can be measured to be 100 km north of the Equator.

Acupuncture, as a therapeutic modality is as strong, if not stronger, than western medicine. The World Health Organisation accepts that acupuncture works, and recognises 2066 accepted acupuncture points. An acupuncture point is 5 to 45 mV more positive than surrounding skin, and is dependent on the redox potential of the tissue. Redox potential, an abbreviation of reduction/oxidation potential, is a basic measurement of the acid/base potential of the tissue.

When an acupuncture needle is inserted a number of effects occur:

- A change in electromagnetic field potential due to piezoelectric effect on the collagen by the pressure of the needle;
- When needle is withdrawn, a discharge of injury may be measured at the skin surface further altering the electromagnetic field potential of the surrounding skin;
- Due to the minute needle damage, polymorpho-neucocytes release histamine which causes blood vessels to leak releasing immunoglobulin to heal the damage. The side effect of the histamine is redness, swelling and itching.
- At the well of damage caused by the needle, prostaglandins are released as primary or extracellular (pain) messengers. These stimulate the nerve endings (epidermal endings of bare nerves and Merkel discs) as well as deeper structures such as the Meisner corpuscles of the subcutaneous nerves.
- The prostaglandin stimulates cyclic AMP production (as a secondary intracellular messenger) in the nerves, which in turn opens the voltage gated sodium channels. This changes the relative internal-external electrical field potential across the nerve cell membrane. This change is transmitted down the nerve where it opens a large calcium channel. The influx of calcium forms calmodulin, a protein which attaches to the chemical synapse messenger vehicle (normally acetylcholine), causing the nerve to now be positively charged and thus allowing the synaptic membrane to spill its contents into the synaptic cleft.

LIGHT INTERACTING WITH TISSUE

Western medicine has long accepted the reliability of electromagnetic diagnostic tools; western medicine is slowly coming to a deeper understanding of the potency of electromagnetic therapy tools. It is clearly understood that the application of a magnetic field on tissue induces an electrical field. Applying light to tissue induces an electrical field directly and safely.

Due to recent research into the structural analysis of light harvesting antenna proteins, more is now known about proteins involved in photosynthetic energy transduction than is known for any class of membrane protein, involved in any other function. Collagen is one such antenna protein and reaction centre which converts light energy into a charge separation across the membrane.

Collagen, both piezoelectric and pyroelectric, reacts consistently to electromagnetic radiation with the physics of all semiconductor reactions; that is, pressure causes deformity which causes electricity (electrical charge separation), and conversely electricity causes deformity which causes pressure. It is the pyroelectric effect of collagen which facilitates the action of infra-red light, just as it facilitates the action of cold packs, hot packs and warming gels.

Light penetrates tissue in relation to its power and wavelength; penetration of light is defined when 60% of the incident light is absorbed. After absorbing photons of light energy, the protein changes shape and therefore changes the absorption spectrum. Red light (600 to 1100 nm) penetrates such non-homogenous tissue well, but is not highly absorbed due to the skin's refractive index of 1.32 to 1.4. The energy level is reduced to within the main absorption spectrum of various components, such as the cytochromes in the mitochondrial membranes.

When red light is placed on an acupuncture point it promotes AMP cycle directly. The attracted white-blood cells release the vasodilator serotonin, not histamine, increasing the microcirculation reducing pain and changing the redox potential of the tissue. By applying a red light to the area and making it negative in relation to the surrounding tissue, the wound does not gape and heals by primary intention. This results in electron transport and oxidative phosphorylation (Krebs's Cycle biochemistry).

There can be no argument as whether it works or not, only informed discussion on the possible mode of action

LASERS

There is considerable information on the use of both laser and light on acupuncture points. As only non-coherent light can be absorbed by tissue, there is definitive work demonstrating that laser are not effective due to losing its special characteristics within the first few millimetres of tissue.

Any claim that the deeper the light the greater the healing is not correct. If any form of energy is penetrating deeper it is not being absorbed, and thus wasted. Radio waves are an example of energy which penetrates deeply though buildings and human bodies and provide no healing effect whatsoever.

REFERENCES

Biomedical Photonics Handbook, Truan Vo-Dinh, (2003)

Bioelectromagnetic Medicine (2004)

Biochemistry, Voet and Voet

Physics, Kane and Sternheim

Bioenergetics, Nicholls and Ferguson

Medical Neuroscience, Pritchard and Alloway

Chemical Messengers, Hardie

Body Electric, Becker

The work of Nobel Prize winner Peter Mitchell (1980), on chemiosmotic theory

The work of Nobel Prize winners Diesenhoffer, Huber and Michel (199?), on describing the precise atomic structure of the reaction centre within protein

Still to be accurately mathematically modelled is how light interacts with tissue. A number of simple assumptions exist (tissue is homogenous, the piezoelectric and pyroelectric effects of subcutaneous collagen and the basic location of all the nerve beds are not acknowledged, and photons are spherical in order to explain the Raleigh, both elastic and inelastic Raman and Mie type scatterings of light). This modelling, at high power, assists explanation of CAT scans, PETR scans, MRI etc; it is yet to explain the therapeutic results of light. Nobel Prize, anyone?