

# Meeting Traditional Chinese Medicine's Qi and blood circulation ideal with a new evidence-based light therapy method

T Lew Lim, Mediclights Research Inc., Toronto, Canada. 31 May 2010

## *Summary*

*The origin of Traditional Chinese Medicine ("TCM") largely goes back to the classical text, "Huangdi Neijing". It is a compendium of work up to the point when it was compiled more than 2000 years ago, and when translated with integrity to its original meaning and context holds up remarkably well today.*

*The ideal of TCM with regards to Qi and Blood is to ensure that oxygen and other nutrients are circulated throughout the vascular network in the body unimpeded. It is not a metaphysical phenomenon as many followers of popular TCM have learned to believe. The main key lies in the health of the blood circulatory system.*

*Remarkably contemporary as it is, there seems little that it can add to present scientific knowledge. However TCM's holistic approach is persuasive in offering itself as complementary to modern medicine. Its focus on the blood circulatory system should be appealing – take care of that and you take care of most of your health issues. Pharmacological intervention with all its side effects should rationally be secondary to a natural and inherently safe pathway such as this.*

*However, the TCM modalities of acupuncture, qigong and herbal therapy remain largely short with regards to credible evidence to support their efficacy. This opens the door to a new non-pharmacological approach that is true to the traditional holistic approach and yet has credible scientific basis and evidence.*

*In this respect, this paper proposes a certain light therapy modality, which is already deployed as mainstream medicine in some countries but largely unfamiliar to the North American medical community. Specifically, the method of low level laser therapy ("LLL") has built up a substantial body of evidence to support the indication that it is able to achieve red blood cell ("RBC") disaggregation and better blood circulation. The improved blood circulation is achieved from the method of illuminating the blood. Until now, the most common way (mainly in Europe) is to perform intravenous irradiation. The Mediclights method and system is a new non-invasive way to achieve the same result with a 91 percent success rate in breaking up RBC aggregation, and hence improve blood circulation, consistent with the original TCM objective.*

*The evidence produced with this method not only shows success in removing a major factor for impediment to blood circulation - RBC aggregation. It also produces evidence of being a successful direct intervention for many diseases and disorders.*

## Introduction

Throughout history, civilisations have appreciated that blood is fundamental to the survival and propagation of human life. However, blood circulation has not been substantially understood until relatively recently. To the Chinese, the theories related to “Qi” have been the backbone of their medical therapy. And it has always been closely linked to blood and its circulation.

According to age-old Traditional Chinese Medicine (“TCM”) principles, the relationship between Qi and Blood is often quoted as follows: “Qi is the “commander” of Blood, and Blood is the “mother” of Qi. Where Qi goes Blood must follow. Where Qi is, Blood is already there”. One cannot exist without the other and both support life. Substantial revisions and updates have been made to the original thesis written more than 2,000 years ago. An exposition of this TCM understanding of Qi and Blood is provided in the **Appendix 1** to this article.

This paper discusses existing and new evidence to bring up to date the centuries-old understanding,

## Qi and Blood Circulation: Reconciling TCM and conventional medicine

To many members of the modern medical community, the concept of *Qi* as commonly understood, is irreconcilable with modern science. Indeed an in-depth study of this “Qi” from the Chinese historical texts of various sources have shown that it is an amorphous term. It could mean any of the terms: *vital energy, breath, air, gas, spirit* or some kind of mysterious *force* that is as ancient and potent as the what makes the universe exist.

Qi has been a key factor in early Chinese philosophy, religion, geomancy, martial arts, meditation methods, acupuncture, herbal therapy, shamanism and almost anything that governs the lives of ancient Chinese. It is beyond the scope of this discussion to venture beyond the medically relevant definitions. For this reason, we will confine discussions to what was understood by ancient Chinese physicians. This inevitably takes us back to the classical texts that have become the foundation of TCM. Then an attempt to understand Qi within this scope becomes more manageable; and we learn that the problem of reconciling TCM and conventional medicine may not be with the original texts but with accuracy of their translation.

The foundation of Chinese medicine is often credited to a book called the *Huangdi Neijing* or “Yellow Emperor’s Classic of Internal Medicine” which is believed to have been written over 2,000 years ago. It is a massive manual.<sup>1</sup>

The manual demonstrates how advanced Chinese medicine was at the time. The Chinese were already performing detailed dissections and able to describe the functions of the major organs including the heart as the organ that pumps blood throughout the body. Western medicine didn’t discover this until another 1500 years later in the 16<sup>th</sup> century. The Chinese at the time even knew which vessels were pumping blood away from the heart, which ones back to the heart, and which ones specifically to which organs. In other words they already understood the key elements of blood circulation.

From the time of the Greek civilisation until the 1600s, Western medicine had thought that the heart was a generator of heat and the role of the artery was to “cool” the blood, aided by the lungs which “fanned” it.<sup>2</sup> In an understanding that were behind the Chinese’ centuries earlier, pre-seventeenth century western medicine thought that the arteries would dilate by sucking in air and then contracting to discharge vapours through pores in the flesh and skin. It was only when William Harvey published his brilliant landmark work in 1628 that blood circulation was presented in the way that we understand it today.<sup>3</sup>

Today the understanding of the function of blood circulation has played a central role in cardiovascular physiology.<sup>4</sup> There is a large body of peer-reviewed publications relating to blood rheology (flow of blood) being the basis of many important health problems. Although these published findings have not been refuted or caused controversy, they are unfortunately simply ignored.<sup>5</sup>

On the other hand, TCM in whatever version recognizes the central role that blood circulation plays by way of blood working together with “Qi” for general well-being and overcoming diseases and disorders. Many TCM practitioners believe that Qi and Blood must co-exist and work symbiotically for the human being or organism to exist. The problem with the concept of Qi as commonly understood today is that it defies any conventional scientific basis in its identification as a “vital energy” or other similar descriptions. To the sceptic this esoteric phenomenon has no place in evidence-based science.<sup>6</sup> There are numerous articles in the same vein but in the end, Qi is not measurable, so it cannot withstand the scrutiny of mainstream research.<sup>7</sup>

Qi is popularly recognised as an entity outside the blood circulation system, and is *energy* in a metaphysical way. However, the classical Chinese language is very context-sensitive and the relevant surrounding factors should be considered to extract the true meaning of the word. With this taken into account, it turns out that the most accurate translation of Qi is not “energy” but “air” (or sometimes referred to as “breath”). We happen to have embellished a simple word such as “air” and dressed it up as “vital energy”.

When the classic *Huangdi Neijing* was first documented it was an accumulation of works that were built up during the ages that shamanism prevailed and illnesses were attributable to demonic forces.<sup>8</sup> The idea that *Huangdi Neijing* distanced itself from superstition and introduced the effects of diet, lifestyle, emotions, environment, and age to address diseases was remarkable and far beyond the times. But it was still a different time, and the understanding of science and medicine as we know it today was virtually non-existent, with no credible scientific bases for cross-referencing.

The *Huangdi Neijing* and related scripts were written in a Chinese dialect that hadn’t been in common use for more than a thousand years before it was translated first into a European language. It is also not a language that most modern Chinese people can understand. Sivin, an historian of science gave the opinion that “no available translation (of it) is reliable.”<sup>9</sup>

Researchers like Kendall re-examined the original texts and assign more precise translations. This discussion has drawn upon Kendall’s work to understand what the original text actually

mean in today's scientific terms.<sup>10</sup> For example, in the *Huangdi Neijing*, the authors described the lungs breathing in what they call "Da Qi", which is literally "great air". This is different from the interpretation of "Qi" as *energy*, first translated into French by Georges Soulie de Morant, a French diplomat based in Shanghai in the 1930s. *Air* would be scientifically easier to appreciate than *energy*. The texts explained that when the lungs breathed in air, they extracted the *Qi* from the *Da Qi* – that is, the lungs extracted a vital *air* substance from "great air".

What this *air* substance extracted by the lungs is, can only be interpreted as *oxygen*. In the Chinese dictionary, there are ten definitions of Qi but none refer to it as "energy". Now we can start relating Qi more clearly to *blood*, specifically red blood cells ("RBC") which are the main formed elements of blood. Their main function is to carry oxygen and perfuse it throughout the body, or as the Chinese say, "nourish the body". The Chinese at the time would not have known about oxygen as a molecule but they did understand that we extracted something essential to life from the air we breathed – which they sometimes called "vital air". TCM teaches that Qi resides in blood. *Oxygen* is the "nourishing" molecule that resides in blood.

In *Huangdi Neijing*, the authors used "Mai" to describe the *vessels*. "Xue Mai" would be literally translated as blood vessel ("Xue" being *blood*). It was Soulie de Morant (who had identified Qi with energy) who took the word Mai and incorrectly translated it as the French word "Meridian".<sup>11</sup> This was despite the fact that there was no word for Meridian in the ancient Chinese language. But this has been stuck with us ever since. Based on the persuasiveness of de Morant's writings, his interpretation of this new alternative science secured a firm hold on European imagination which then deeply influenced subsequent conventional knowledge of TCM.

Soulie de Morant promoted the idea that blood, along with a mysterious and undefined energy (Qi), circulates through invisible "Meridians" in the body. This had no relationship to what was written in the classic texts.<sup>12</sup>

The ancient texts had diagrams of acupuncture points on the body. De Morant took pictures of these diagrams, drew lines to connect them and created the concept of the Meridian system. The original texts already had drawings of major arteries going from the trunk into the legs. The points were arranged along these arterial routes. Therefore the "Meridian" as offered by de Morant was a misnomer for arterial networks.

Based on de Morant's work, the understanding of Qi would appear to be metaphysical, functioning in parallel while co-existing with the blood system. However with the literal translation of Qi as *air* (which can be interpreted as *oxygen*) and Mai as *vessel*, it becomes clear that there is no disagreement between ancient Chinese medical theory and contemporary principles of physiology for blood circulation. Therefore TCM is not metaphysical but as real as what we understand modern medicine to be. It does establish that the ancient Chinese understood correctly that blood circulation would be the key to health. The primary aim would be to keep that "Meridian" channels unblocked, which would mean to keep the blood circulating unhindered so that the whole body is thoroughly nourished, whether as preventive medicine or as an intervention to overcome diseases.

Early TCM thought leaders like Willem ten Rhijne, back in 1683 (and before de Morant's interpretation involving energy flowing through meridians took a foothold) had already understood that the Chinese focus was on blood circulation along with the structure and function of the vessels.<sup>13</sup> Today, prominent Chinese TCM researchers such as Xiu Rui-Juan promotes the central role of blood circulation in health, and more pointedly that impaired blood flow to any region of the body, including internal organs, can result in pain and dysfunction.<sup>14</sup>

With the passing of several years of further scientific progress and before he died in 1955, de Morant corrected his definition of Meridians to say that they were actually *blood vessels* (but he did not correct his definition of *Qi* being *energy*). However, one may argue that energy is latent inside the oxygen molecule that the red blood cells ("RBC") are carrying; and with one degree of separation, the understanding of de Morant, and his many Western TCM followers are perhaps not really different from modern scientific knowledge.

Even the concept of *balance* (in *yin* and *yang*) is not out of place in modern biology. It is equivalent to *homeostasis* – the condition in which the body or cell maintain equilibrium/stability/balance within its internal environment when dealing with external changes. This is an essential condition for the well-being of a mammalian organism.

### **The concept of blood stasis**

We have established that having good blood circulation is a fundamental principle of TCM. This also means that the state of compromised blood flow, or any form of stagnation should be avoided. In this context, "blood stasis" is a term that is often used in TCM to describe this unfavourable condition. In modern Chinese medicine this is related to many symptoms of old-age, when everything slows down and one becomes senile and vulnerable to diseases, and then eventually the end of life.<sup>15</sup> This knowledge is an advancement from the past TCM theory which postulated that geriatric symptoms relate to the more abstract understanding of "vacuity" or emptiness in the key organs.<sup>16</sup>

Under the microscope, blood stasis will be manifested as RBC aggregation. This is evident from a blood sample in Figure 1 below. Experts in TCM can relate blood stasis to poor blood rheology - which can be identified with RBC aggregation as a factor.<sup>17</sup>

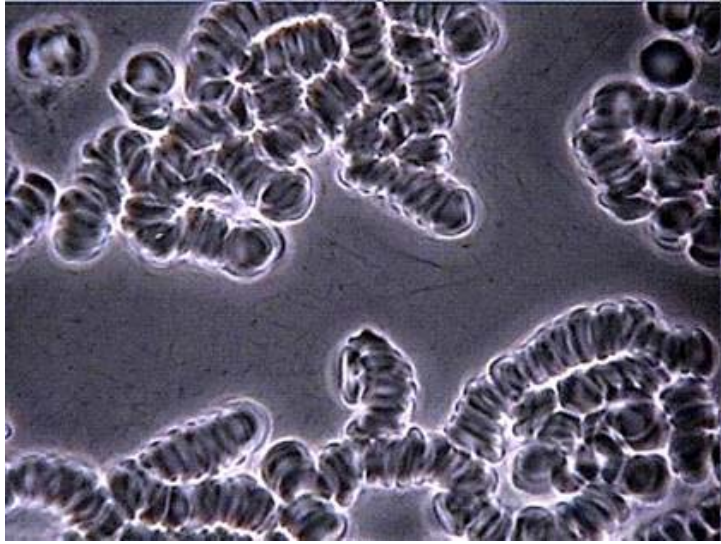


Figure 1: Red blood cell aggregation.

### **From stasis to red blood cell aggregation**

Recent research also shows that stasis in the vein is associated with RBC aggregation.<sup>18</sup> The aggregation is found to be due to the presence of macromolecular proteins such as fibrinogen and globulin.<sup>19</sup> Fibrinogen is the protein which is sensitive to inflammation and helps with the blood clotting function. It is a dominant factor in RBC aggregation.<sup>20</sup> Since inflammation is caused by an illness or disorder, one can attribute the presence of blood aggregation to the presence of an illness or a disorder. Therefore when RBC aggregation occurs, it means that the subject is at least not in perfect health.

### **Red blood cell aggregation to shear stress**

Blood has a non-Newtonian fluid behaviour. Once it gets moving and builds momentum, it flows fast. Unlike water, which exhibits much more Newtonian properties, blood moves sluggishly at low speeds and is more liquid at fast speeds. When the heart is resting between beats (diastole) it becomes more viscous and then when the heart forces blood out (systole), with the higher shear stress blood becomes less viscous.

It is important to recognise that the presence of high RBC aggregation (along with hematocrit and plasma viscosity) is a factor contributing to low shear stress. Low shear stress leads to high whole blood viscosity.<sup>21</sup> Eventually, elevated blood viscosity and RBC aggregation are important factors in affecting blood circulation, cardiovascular diseases and a number of diseases, as found in the cumulative work of renowned haemarrheology (blood flow) researcher, Dintenfas.<sup>22</sup>

Low shear stress regions along the arterial walls is associated with the occurrence of lesions.<sup>23</sup> This leads to deposit of plaque in these areas. When the plaque builds up, blood flow is further

impeded, leading to turbulence and more plaque deposition. When the plaque deposition reaches a critical stage, it often causes vascular occlusive (blockage) disorder<sup>24</sup>, and thrombosis (blood clot) both in arterial and venous systems. This is the prelude to cardiovascular events such as heart attacks and strokes. Before that happens, the subject exhibits classic symptoms indicated in TCM with blood stasis – such as reduced immunity, increased tiredness and so on, making the subject vulnerable to diseases.

### **Effect of RBC aggregation on blood circulation and tissue perfusion**

There is considerable amount of research conducted by a core group of researchers on the effect of RBC aggregation on blood circulation and tissue perfusion. Among the leading researchers are Baskurt and Meiselman. It is apparent that this body of research is growing with evidence that the interplay of these elements hold important keys that are central to a person's well being.<sup>25</sup> A more detailed extract of their review are presented in **Appendix 2**.

In summary there is substantial evidence to show that RBC aggregation impedes blood flow. The presence of RBC aggregation affects microcirculatory blood flow, venous flow, whole organ perfusion, and tissue hematocrit. Freedom from RBC would be a very desirable health condition.

### **Red blood cell aggregation is an independent risk factor**

Studies also show that the presence of RBC aggregation is an independent risk factor for vascular occlusive disorder<sup>26</sup> and thrombosis both in arterial and venous systems<sup>27</sup>. With these properties, RBC aggregation would also be identifiable with poor circulation in the small capillaries. These studies show that RBC aggregation is also related to blockages in the larger vascular network, caused by the formation of plaques.

### **TCM modalities to overcome stasis and improve blood circulation**

To overcome stasis and improve blood circulation, TCM modalities usually include one or a combination of acupuncture, qigong exercise and herbal therapy. There are studies that support as well as dispute the efficacy of these therapies, the most numerous being in the case of acupuncture. The effectiveness of acupuncture remains in dispute. The emerging clinical evidence seems to imply that acupuncture is effective for some but not all conditions.<sup>28</sup> In several cases suggestions have been made that positive results can be attributable to the placebo effect.<sup>29</sup> Recent experiments on mice show that acupuncture therapy stimulates the release of adenosine which is a numbing agent to nerves.<sup>30</sup>

Acupuncture therapy (both traditional and medical) is directed at specific areas commonly known as *pressure points*, *acupoints* or *nodes*, where there are fine branches of vessels (arterioles, venules and capillaries) and related nerves that supply nutrients to the various parts of the body. Therefore acupuncture is a point-specific methodology.

The other modalities of TCM-based herbal therapy and qigong are more holistic. They improve overall circulation but the evidence are even more scarce, with much of the explanations still

based on the *energy-meridian* concept. However, being of a more holistic approach, they would be complementary to acupuncture therapy.

### **TCM contribution to modern medicine**

TCM has largely been unchanged since the time of *Haungdi Neijing*. Once it is accurately translated there seems virtually nothing of substance in the works that can be taught or added to modern medicine. This is not counting the negative credibility of the popular TCM presentation of a metaphysical *energy-meridian* system which is a misrepresentation of the original texts as well as the lack of efficacy evidence to support the modalities.

Notwithstanding all the questions raised, TCM takes a more holistic approach to conventional medicine with a greater emphasis on harnessing the body's natural healing ability. It may not be able to add anything new to modern science but it takes on an important role that modern medicine has largely neglected – presenting itself as preventive medicine by taking care of the body's blood circulation in a holistic way. With that, mainstream medicine should not dismiss it but should consider embracing the principles as complementary – not necessarily as alternative therapy.

Some medical practitioners already do this, particularly those who have either come from a culture that already embraces this philosophy (the Chinese) or those who recognize the merit of TCM as being complementary, or those that appreciate the specific qualities of one of the modalities of TCM.

### **The need for a therapy to protect and improve blood circulation**

As expounded earlier, the body cannot function well without a strong circulatory system. More specifically, the blood circulatory system performs the following important functions:

- Supply of oxygen to tissues (bound to haemoglobin, carried in RBCs)
- Supply of nutrients such as glucose, amino acids and fatty acids. These are dissolved in the blood or bound to plasma.
- Removal of waste such as carbon dioxide, urea and lactic acid.
- Immunological functions, including the circulation of white blood cells and the detection of foreign material by antibodies.
- Blood clotting or coagulation as part of the body's self-repair mechanism.
- Performing messenger functions, including the transport of hormones and the signalling of tissue damage.
- Regulation of body pH (measure of acidity).
- Regulation of core body temperature
- Hydraulic (fluid mechanical properties) functions, and several more functions.

Within the limits of scientific knowledge at the time it was written, *Huangdi Neijing* provided a deep appreciation of the importance of a blood circulation and why it is necessary to allow the system to perform at an optimum level.

However, we are entering the age of evidence-based medicine (“EBM”) and it challenges TCM, perhaps not so much the philosophy of a holistic approach but the bases of the specific therapies that still explain themselves with the *energy-meridian* system, or worse still with the influence of astrological and spiritual elements. There are many anecdotal evidence based on experiences that gives alternative medicine its growing appeal. Until sufficiently supported by evidence TCM will remain in the fringe of what is acceptable in mainstream medicine.

What if there is a non-drug based therapy that will improve blood circulation in the tradition of TCM?

As discussed, poor blood circulation can be caused by RBC aggregation.<sup>31</sup> Therefore the efficacies that is attributed to RBC disaggregation also leads to improved blood circulation.

An approach to help the body to control or even reverse RBC aggregation supported by much more credible evidence, is through the application of light therapy that irradiates the blood stream - a method that is supported by evidence and largely overlooked by the North American medical communities. Light therapy involving blood irradiation, especially with the better known low level laser therapy (“LLLT”) can improve blood rheology. On this basis it can be better accepted as an evidence-based complementary therapy to mainstream medicine.

### **The approach using low level laser therapy**

The Russians have been irradiating the blood with LLLT through an intravenous method for more than 30 years.<sup>32</sup> See Figure 2 below.

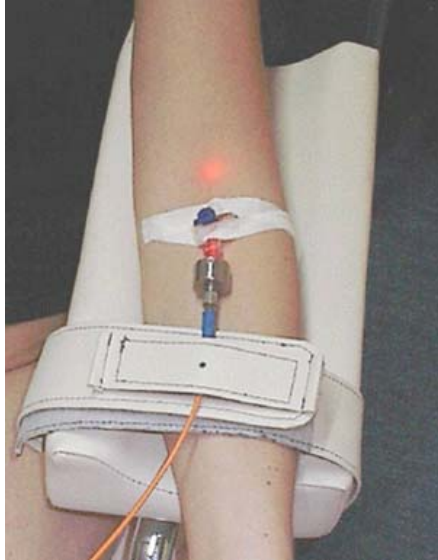


Figure 2: The alternative invasive method of “intravenous blood irradiation therapy”.<sup>33</sup>

In 2005, a study estimated that 1.5 million patients were treated annually with this method throughout Europe. The same study states that, “the worldwide interest in LLLT is illustrated by its use in more than 85 institutions in over 37 countries. Since the first study was reported in 1967, some 2500 papers have been published in a range of journals worldwide and the value of LLLT is much better reported than many believe. Its scientific background is sound enough to say that it is both safe and effective.”<sup>34</sup> No major side effect has also been found.

Direct controlled studies have shown that LLLT leads to a decrease in the degree of RBC aggregation and, accordingly, to an increase in the velocity of blood microcirculation.<sup>35</sup>

### **The theoretical explanations for LLLT disaggregation of RBC**

#### The anti-inflammation theory

As mentioned earlier, the presence of RBC aggregation is commonly attributed to inflammation which then stimulate the release of fibrinogen into the blood circulation system.

When inflammation is reduced through LLLT, the level of fibrinogen in the blood will also be reduced. As the result RBCs will be visibly disaggregated.

Literature suggests that LLLT reduces inflammation through healing and regeneration actions, amongst which include stabilizing the cellular membranes<sup>36</sup>, enhancing ATP production and synthesis which contribute to cellular healing<sup>37</sup>, vasodilatation (dilation of blood vessels)<sup>38</sup>, acceleration of leukocyte and lymphocyte activities to remove damaged cellular components and allowing for more rapid repair<sup>39</sup>, and helps regenerate blood capillaries<sup>40</sup>.

There is also a recent study suggesting that LLLT illumination “decreases the amount of inflammation and accelerates the wound healing process by changing the expression of genes responsible for the production of inflammatory cytokines.”<sup>41</sup>

#### The photodissociation theory

Tests on rabbits established that hemoglobin is a primary photoacceptor absorbing low-intensity laser radiation of light of red and infra-red (“IR”) wavelengths. The exposure of blood to this radiation causes clearly defined changes in the IR and visible absorption spectra of the blood and erythrocytes (red blood cells). These spectral changes arise as a result of partial photodissociation (breaking down of chemical compounds with light) of hemoglobin-ligand (substance to bind biomolecules) complexes in the process of absorption of laser radiation. It is suggested that photodissociation is a primary reaction that arises in blood exposed to a low-intensity laser radiation.<sup>42</sup> This result is the disaggregation of aggregated RBC.

#### The transient local heating hypothesis

Upon contact with blood, a substantial amount of absorbed red light energy is converted to heat, which causes a local transient increase in the temperature of absorbing chromophores (molecules responsible for their colours). This local transient heating of absorbing molecules is different from the general heating of the whole cell, tissue and organism as commonly imagined. The local transient increase in temperature causes structural changes, and trigger biochemical activity that results in the disaggregation of RBC.<sup>43</sup>

#### The negative surface charge theory

Some researchers suggest that LLLT raises and restore the negative surface charge of the RBCs, rebalancing the play with electrolytes, and restoring their natural state of the RBCs repelling each other.<sup>44</sup>

#### Summary

In summary, there are several theories as to how LLLT would neutralise RBC aggregation. What matters is that LLLT is proven to succeed in disaggregating RBC.

### **Doing it with the Mediclight Red-Rx**

The Mediclight Red-Rx, pictured below is a hand-held portable non-invasive blood irradiation device using the LLLT method.



Figure 3: Mediclight Red-Rx LLLT device

In using this unique device, the nose-clip applicator delivers low level laser into the vascular rich capillary bed in the nasal cavity for 25 minutes, as illustrated below. Any young adult can self-administer it without supervision. There is no feeling of any noticeable discomfort

The method of illuminating the nasal cavity to achieve the efficacy is patent pending. Unlike the older Russian method which is already widely used in Europe, the Mediclights method is non-invasive and requires no special training to use.

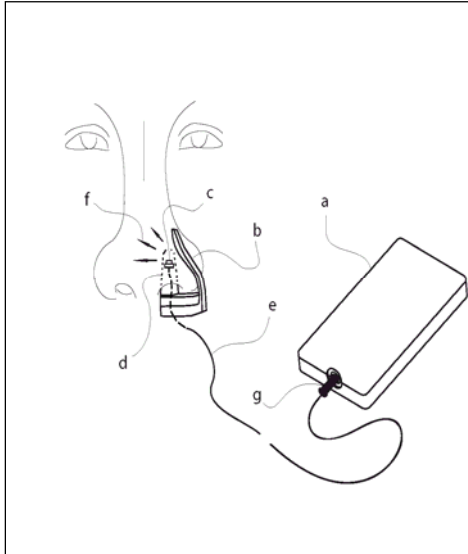


Figure 4: Applying the MedicLight Red-Rx

The purpose of the device is to disaggregate the RBC and keep the RBC in the circulatory system free of aggregation and hence avoid the health disorders associated with this condition. The figures below are actual before-and-after microscopic pictures of blood samples of a subject

that used the device for a 25 minute treatment. The picture in Figure 5 was taken before the treatment, and the one in Figure 6 after the treatment.

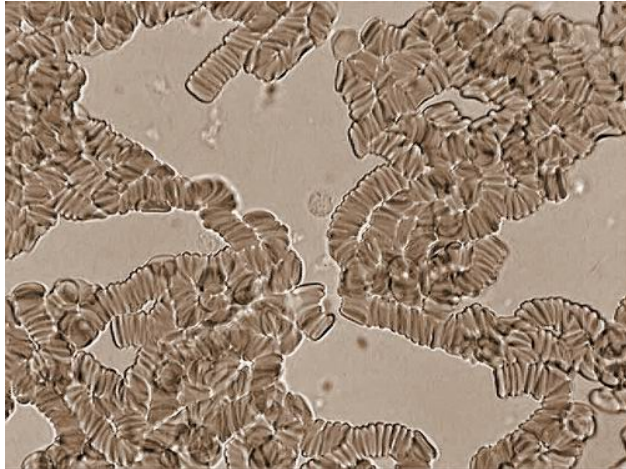


Figure 5: Blood sample before using the device

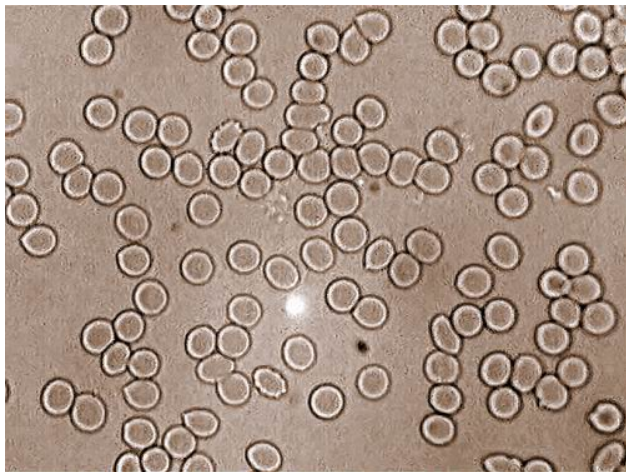


Figure 6: Blood sample after using the device.

Visually, it is clear that the main difference between the two samples is how the RBCs are seen to be aggregated in Figure 5 and disaggregated in Figure 6. More evidence captured in video can be viewed at this hyperlink - <http://www.youtube.com/watch?v=nfUQNJWDFqQ>.

### **Why the nasal cavity**

The nasal cavity is as good as anywhere else in the body if we seek to illuminate the blood and then expect the effect to be rapidly circulated throughout the body. It is also non-invasive. Just beneath the thin walls surrounding the nasal cavity is a rich vascular capillary bed. These capillaries are specifically designed for rapid passage of fluids through the vascular wall and out into the dry air.<sup>45</sup> The vascular walls in this region are particularly thin and sensitive, making them highly receptive to any biostimulation. The amount of blood flow to this area is considerable, and it is higher per unit of tissue than the blood flow to the brain, liver or muscle.<sup>46</sup>

### **Tests results of the Mediclights device**

From November 2006 to September 2009, the device was used to test 384 patients with different health conditions. The success rate for disaggregating aggregated RBC was 91 percent, with 7 percent unchanged. No side effect was observed. The data are backed by video capture of blood sample evidence much like the way the samples of Figures 5 and 6 were recorded. Details are presented in **Appendix 3**.

### **The key is in delivery of wavelength under controlled parameters**

Although a large body of evidence supports low level laser in the red band of the light spectrum to deliver the above therapy, the key appears to lie in the wavelength of the light of around 633 nm as opposed to whether it is coherent (as in laser) combined with the energy dosage and time phase.

Renowned Russian LLLT scientist, Karu states that incoherent red LED is expected to perform the same way as LLLT as, "...the coherence of light is of no importance in low-power laser clinical effects" and "the primary difference between lasers and LED's is that the laser's coherent beam produces "speckles" of relatively high power density which can cause local heating of inhomogeneous tissues".<sup>47</sup>

Although some proponents of LLLT argue that the coherent property of lasers is superior to the incoherent property of light from LED, initial testing by Mediclights with LED challenges this notion. They found that illumination of the nasal cavity using certain red LEDs with re-tuned dosage and time phase, appears to produce similar results of RBC disaggregation as with LLLT. This could be explained by the thin epidermal barrier and high sensitivity of the micro vascular networks in the nasal cavity which would accommodate a wide variation of light coherency.

### **Conclusion**

Based on more precise translation of the classical text, *Huangdi Neijing*, the objective of TCM with regards to Qi and Blood in the context of today's medical knowledge, is to ensure that oxygen in the blood is circulated throughout the vascular network in the body unimpeded. It is not a metaphysical phenomenon as many followers of popular TCM have learned to believe. That unfortunate tag has been based on the mistranslation of the classical text and then became

widely accepted for many years, fanned by the momentum of the growing popularity of alternative medicines.

However TCM's holistic approach to medicine is persuasive in offering itself as complementary to modern medicine. Its focus on the blood circulatory system should be appealing – take care of that and you take care of most of your health issues. Pharmacological intervention with all its side effects should be secondary to this natural and inherently safe pathway.

On the other hand, the traditional Chinese modalities of acupuncture, qigong and herbal therapy remain largely short of credible evidence to support their efficacy other than for pain management in the case of acupuncture. This opens the door to a new non-pharmacological approach that is true to the traditional holistic approach in improving blood circulation, and yet has acceptable scientific basis and evidence.

The proposed light therapy pathway, specifically, the method of low level laser therapy (LLLT) is building up a substantial body of evidence to support the indication that it is able to achieve RBC disaggregation and better blood circulation. The improved blood circulation is achieved from the method of illuminating the blood. Until now, the most common way (mainly in Europe) is to perform intravenous irradiation. The Mediclights method and system is a new non-invasive way to achieve the same result with a 91 percent success rate in breaking up RBC aggregation, and hence improve blood circulation, consistent with the original TCM objective.

The evidence produced with this method not only shows success in removing a major factor for impediment to blood circulation - red blood cell aggregation. It also produces evidence of being a successful direct intervention for many diseases and disorders.

# APPENDIX 1

## The Relationship between Blood and Qi in Popular TCM

The discussion here is based on the common contemporary understanding of Blood and Qi based on Traditional Chinese Medicine (“TCM”). Much of this understanding is based on a popular interpretation of the 2,000 year old classical work, Huangdi Neijing.<sup>48</sup> For purposes of discussion we will still refer this interpretation as “popular TCM”, which is arguable different in many key aspects to those presented in the main body of this paper which is largely based on Kendall’s more accurate translation.<sup>49</sup> Popular TCM has been permeated with the *energy-meridian* explanation originally postulated by Soulie de Morant.<sup>50</sup>

There are various versions of TCM being presented. A popular interpretation believes that in relation to Blood, Qi has three main functions, as follows:<sup>51</sup>

1. Generating Blood: This means that the generation of Blood depends on Qi. Blood is composed of Body Fluids (saliva, gastric fluid, intestinal fluid, joint cavity fluid, tears, nasal discharge, sweat, urine, etc.) and Nutritive Qi. They are from food processed by the activities of Spleen Qi and Stomach Qi. We need these Qi activities to firstly transform the food into Food Essence, then into Nutritive Qi and Body Fluids, and finally ending in the formation of Blood. Without all these Qi activities, there would be no Blood.
2. Moving/propelling Blood: This means that Blood, a *yin* substance which is motionless in nature, depends on Qi for its movement. To be exact, the Heart Qi moves Blood by maintaining the beating of the Heart; the Lung Qi pushes and disperses Blood; and the Liver Qi helps to regulate the free flow of Blood. When Qi is weak the Blood flow will become sluggish signalling that Blood Stasis is occurring.
3. Controlling the flow of Blood: This means that Qi (mainly the Spleen Qi) functions to keep Blood flowing within the vessels to prevent haemorrhaging.

According to TCM, Blood has the following physiological functions:<sup>52</sup>

1. “Nourishing the body: If the Blood circulates ceaselessly, it fully nourishes the entire body and enables the discharge of waste. Therefore, Blood is an essential requirement for the maintenance of life.
2. Nourishing and fostering the spirit: Blood is the basic material supporting the human “essence” spirit (i.e. mental/emotional) activities. The heart controls the Blood. It also governs the spirit and orientation. When the heart is nourished by Blood, the spirit becomes clear and sharp. In mild cases of abnormal blood condition, heart palpitations and forgetfulness may occur, alongside a weakened immune system.
3. Maintaining the balance of yin & yang: Blood pertains to *yin* and Qi pertains to *yang*. Disease cause changes in the Blood properties, leading to the imbalance of *yin* and *yang*.
4. The reproductive function: When Blood is strong, the man or woman is fertile.

According to TCM, all the above clearly demonstrates that the Blood has a very important role in the maintenance of life activities.”

Blood also has the following effects on Qi:<sup>53</sup>

1. Blood generates Qi: Blood provides the “essence” for the production and functional activities of Qi. This essence is the basis for the production of all the various kinds of Qi in the body. Hence the ancient saying, “Blood is the mother of Qi”.
2. Blood carries Qi: Other than being the “mother”, Blood is also the carrier of Qi and Qi is the “transporter” of blood throughout the body. If Qi does not reside within the Blood, it will float about aimlessly. Hence the saying, “Blood is the dwelling place of Qi”.

In summary, Qi is the “commander” of Blood, while Blood is the “mother” of Qi. Blood is yin and Qi is yang and both are interrelated. Qi is blood without form, while Blood is the form of Qi. The Blood includes Qi within it. Therefore Qi and Blood are interdependent and circulate together in the body. If Blood and Qi are not in harmony, then the body will succumb to diseases.

That is the contemporary popular TCM understanding of Qi and Blood.

#### Literal study of *Huangdi Neijing*

A study of the classical texts by Kendall states that the most critical role of blood is the distribution of vital substances (which includes qi – air/oxygen) and body fluids. Increased formation and circulation of blood can lead to increased levels of oxygen, nutrients, and functional activity. Similarly, an increase in the formation of these vital substances and body function has a corresponding effect on blood. The opposite would be true when there is a deficiency in blood.<sup>54</sup>

## **APPENDIX 2**

### **Effect of RBC aggregation on blood circulation and tissue perfusion – by Baskurt and Meiselman**

The following is extracted from a review of evidence-based work on RBC aggregation by Baskurt and Meiselman.<sup>55</sup>

#### Effect of RBC aggregation on microcirculatory blood flow.

In studies employing intravital microscopy it has been observed that intensified RBC aggregation increases microvascular flow resistance.<sup>56</sup> RBC aggregation in arterial and/or capillary microcirculation would affect the bulk viscosity of blood in larger blood vessels and the increased energy cost of disaggregation at the entrance of microcirculation.<sup>57</sup>

RBC aggregation has also been found to decrease the density of functional capillaries, resulting in decreased overall microcirculatory blood flow. This is found to be especially significant under reduced arterial pressure.<sup>58</sup> Enhanced RBC aggregation also fills capillaries with non-flowing RBC making these capillaries dysfunctional.<sup>59</sup>

#### Effect of RBC aggregation on venous flow resistance

The venous side of the circulatory system returns deoxygenated blood back to the heart and lungs to discharge the waste and carbon dioxide. Blood flow in the venous circulation is characterized by lower shear rates (change in velocity of blood flow parallel to vascular walls) compared to the arterial side. For this reason occurrences of RBC aggregation are more significant in the venous circulation areas.<sup>60</sup>

Experiments show that normal RBC aggregation significantly contributes to venous vascular resistance in resting muscles and plays a significant role in vascular system homeostasis (stable bodily state).<sup>61</sup> It has also been demonstrated that RBC aggregation affects velocity profiles in venous blood flow, especially under reduced flow rates.<sup>62</sup> The energy loss caused by RBC aggregation contributes to flow resistance.

#### Effect of RBC aggregation on whole organ perfusion

A study isolated a rat's heart and then perfused it with a different concentration of dextran (a compound often used by researchers to simulate RBC aggregation). The results suggest that relatively low levels of RBC aggregation may reduce flow resistance in the organ, whereas greatly enhanced aggregation greatly increases resistance to blood perfusion to the organs.<sup>63</sup>

#### Effect of RBC aggregation on tissue hematocrit

At the tissue level, tissues are also adversely affected when they are not properly provided with nourishing blood. They are served by the network of capillaries; and as discussed, if the flow is impeded by RBC aggregation, their condition will be adversely impacted. There are however, specific studies that look into tissues: more specifically on hematocrit (the ratio of blood volume occupied by RBC). Tests demonstrate that alterations in RBC aggregation induced by fibrinogen infusions affect tissue hematocrit values in rat myocardium (muscular middle layer of the wall of the heart).<sup>64</sup> These experiments were also repeated using more recently developed poloxmer coating method to alter RBC aggregation. These confirm that enhanced RBC aggregation alters myocardial tissue hematocrit values.<sup>65</sup>

### Summary

In summary there is substantial evidence to show that RBC aggregation impedes blood flow. The presence of RBC aggregation affects microcirculatory blood flow, venous flow, whole organ perfusion, and tissue hematocrit.

## **APPENDIX 3**

### **The aggregation state of red blood cells before and after a 25 minute treatment by the MedicLights nasal illumination device**

**Methodology:** The subjects volunteer to have their blood analysed and treated with the MedicLights nasal illumination device. Before the treatment, each subject has his or her finger tip pricked with a lancing device to extract a small sample of blood. This is placed on a slide and observed under an electronic microscope magnified 40x. With video capture software, a 4 second video image is captured and recorded into a computer hard disk. The subject then clips the applicator of the Device to his nose, pointing the light source to his nasal cavity and turn on the controller. The Device automatically turns itself off after 25 minutes, immediately after which the process of his blood extracted, observed under the microscope and captured repeated.

Although many of these subjects expressed to have some form of illness, we have made no attempt to make any medical diagnosis. The purpose of this collection of data is to document the effect of the Device on the state of aggregation of the red blood cells. Although the effect on viscosity were not measured in these tests, and intended for a separate set of tests, we were also able to visually observe the viscosity of blood as the blood samples were extracted.

**Test Period:** Nov 2006 to 14 Sept 2009

#### **Result**

**Summary:** Total number of subjects = 348

Number of subjects that started with aggregated RBC = 297

Number of subjects that started with disaggregated RBC = 51

Subjects that started with aggregated RBC:





The blood samples are observed to have better properties after treatment, such as increased shear rate and elimination of “crystals”.

Viscosity of the blood also appears to be lower (this is observed when the blood sample is extracted again after the treatment).

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