

## **Oncothermia and traditional Chinese medicine**

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# Oncothermia and traditional Chinese medicine

## *Abstract*

Aim of this article to show the possibility and great advantage of the synergy of oncothermia with traditional Chinese medicine, on the common basis of equilibrium demand. We use the recognition of the deviations from the complex harmony of the organism or its part for selection to act properly.

## *Introduction*

Hyperthermia is an ancient oncology method. It is the very first treatment modality for this type of disease, having 5000 year history [1], based on the Sun as the overall curative force in ancient Egypt. Later Hippocratic paradigm described it using physiological process (acidosis) to eliminate the malignant tissue. This natural approach is in well correlation with the far-away developed medical concept in the same ancient time: the Traditional Chinese Medicine (TCM) [2]. This medical philosophy was also based on natural harmony inside and outside the human organism. In progress of historical time TCM had been more sophisticated and developed, but the hyperthermia could not keep abreast with the development of the medicine, and was hindered by other western medical methods (WMM). However in late 80th of last century a new paradigm of hyperthermia was developed. It is the oncothermia method (OTM) [3]. OTM applies the ancient hyperthermia on different way, replacing the static thermal driving force to dynamical equilibrium concept, promoting the natural processes in curative direction [4]. Asian governments hope that high-volume screening and rigorous clinical trials will unlock the secrets of ancient herbal remedies—and that the results will pass muster with Western scientists [5]. It is a matter-of-course to make synergy between the two approaches, uniting the best line of TCM and OTM. Our present article underlines the main connections with the TCM and oncothermia.

TCM Oncology traces it's roots as far back as the 16th – 11th centuries BCE, as recorded on bones & tortoise shells. Oncology was first recorded in text form in *Zhou Li* compiled between 221 & 207 BCE. Tumors were first discussed in the earliest recorded book on Chinese Medicine *Huang Di Nei Jing*. The Jin, Sui & Tang Dynasties, 220 – 907 CE. The etiology , pathology & treatment of tumors was explored & studied. The use of Herbs, Acupuncture & Moxibustion for the treatment of tumors was further recorded in Chinese Medical texts. Diet Therapy began to be discussed around 581 CE. The Song & Qing Dynasties, 960 – 1911 CE. Theories of tumors developed very rapidly during this period especially between 960 & 1368 CE. Herbal prescriptions were more widely used in the treatment of Cancer. Pattern identification & treatment as well as prognosis became more well developed. Integrative Medicine, 1949 – Present The development of Western Cancer treatments. Large scale clinical & laboratory research into integrated Chinese & Western medicine on the prevention, diagnosis & treatment of Cancer. Integrative medicine treatments of Cancer are the wave of the future.

The TCM is a complex thinking of the integrative frame about the balances of the body and its homeostasis. The basic principle of TCM is centering on the points of the same disease with many patterns and many patterns on same disease balance according to person, time and place. Its pathology based on the imbalance Yin-Yang (negative feedback control of the healthy state), states the disharmony of “Qi” and blood, detects the dysfunction of organs and the local manifestation of toxic pathogenic factors. The diagnosis of TCM is in its basic principles, based on holism, complex approach of the living system and its environment; with identification of patterns and conditions (trying to detect the root causes of disease).

The TCM etiology contains:

- External pathogenic factors,
- Internal damage of 7 emotions
- Improper diet
- Deficiency & depletion of the organs
- Stagnation of Phlegm Fluid
- Stagnation of Qi & Blood

The main features of TCM effects in Western perspective are

- Enhance immune function.
- Restore the balance of the endocrine system.
- Promote blood production.
- Protect the marrow & the function of the Heart, Liver & Kidneys.
- Improve absorption in the digestive tract.
- Boost the metabolic function.
- Stimulate the body's self-regulating ability.
- Reduce the side effects of surgery, radiotherapy & chemotherapy while improving their effectiveness.

These are in complete harmony with the principles and effects of oncothermia which centers on helping the natural feedback processes to reestablish the lost homeostatic equilibrium in the case of malignancies. Oncothermia acts directly in the primary tumor by its apoptotic cell-killing mechanisms. The apoptotic effect as a main selective killing mechanism of malignant cells by oncothermia was proven as well as the blocked dissemination and the abscopal effect on far distant metastases was also proven by measurements and in clinical use. These effects in summary are:

- Apoptosis shown by micro- and macro-morphologies of the cellular death with the end of the apoptotic bodies [6],
- Oncothermia induces the action of p53 tumor-suppressor gene [7],
- The intensive apoptosis in malignancy is shown by cleaved caspase 3 in early and TUNEL in last phase of apoptotic phases [8],
- The apoptosis was controlled by the DNA laddering [9],
- Oncothermia furthermore suppresses the proliferation in the primary tumor [10],
- Oncothermia forms leukocyte invasion around the primary lesion [11],
- Oncothermia activates the neutrophils [12], which also measured by myeloperoxidase presence [13],
- Oncothermia as new targeted therapy is completed by the blocking of dissemination by rebuilding the adherent connections [14] and the junctions [15] between the malignant cells
- Oncothermia acts on far distant metastases by bystander (abscopal) effect [16].

### ***Homeostatic control as basis of synergy of Oncothermia and TCM***

The life is based on energetically open systems, where the environmental conditions determine the life as equilibrium. The living equilibrium is the homeostasis. The actual homeostatic state is definitely “constant” despite its energetically open status, (see Figure 1.). Normal healthy state of any living systems is in homeostasis, which is not static, but dynamically changing in time, forming a relatively stable state. This relative stability makes possible to recognize the various individuals, despite millions of their cells are actually vanishing and millions of those reborn. The homeostasis is controlled by numerous negative feedback loops [17], [18], making the micro- and macro-structures in equilibrium.

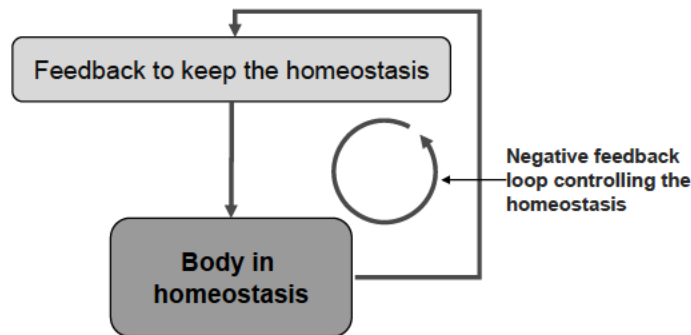


Figure 1. The natural healthy state is stabilized by the negative feedback loops of physiology

The disease breaks the relative equilibrium, risks the relative stability of the system. The system tries to reestablish the homeostasis. For this enhanced negative feedback control is enforced (see Figure 2.).

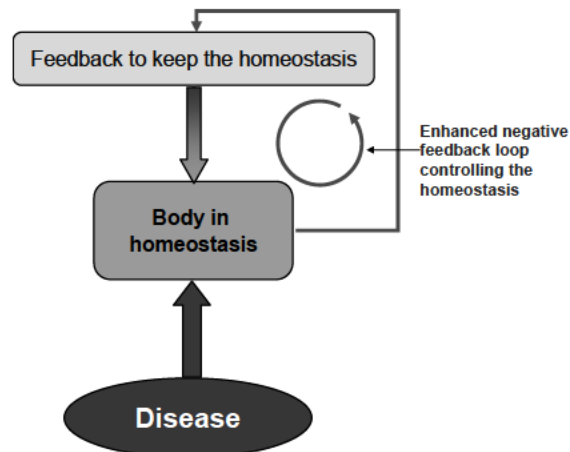


Figure 2. The disease breaks the homeostasis, so the physiology tries to compensate and correct the damage

The natural therapy must help the body's internal corrective actions to reestablish the healthy state. Recognizing the disease most of the medical approaches act with changes of the conditions (diets, medicaments, other supplies) trying constrain the body in the previously working equilibrium. However, in many cases, it works against the natural homeostasis, the constrained action induces new homeostatic negative feedbacks from the living object. The living organism starts to fight against our constraints together with the fight against the disease (see Figure 3.) [19].

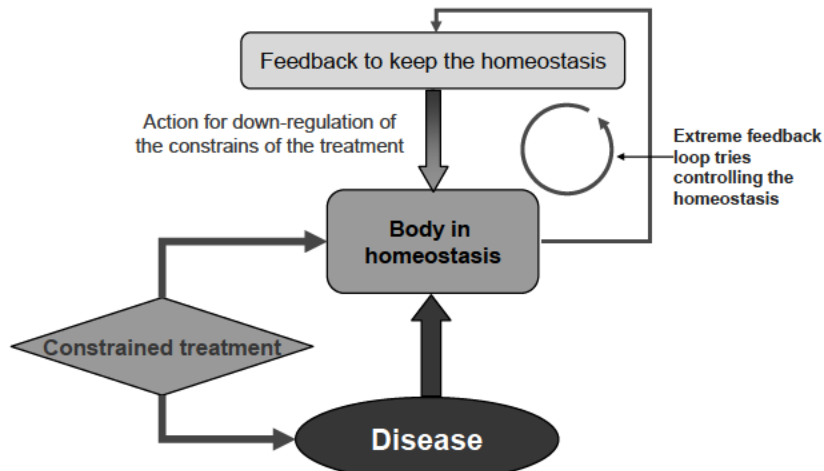


Figure 3. The classical hyperthermia introduces a new constrained effect which induces even more physiological feedback, forcing the body for the "double front" fighting

This controversial situation happens for example in case of the classical hyperthermia, when the constrained massive temperature change is physiologically down-regulated (or at least the physiology works against it by the systemic [like blood-flow] and local [like HSP] reactions) [20]. Oncothermia disclaims the old approach, introducing a new paradigm: with the application of micro-heating induces considerably less physiological feedback to work against the action, and with the application of the electric field it uses such effect, for which the body has no physiological answer. With this new paradigm, oncothermia helps the natural feedback mechanisms to reestablish the healthy state (see Figure 4.).

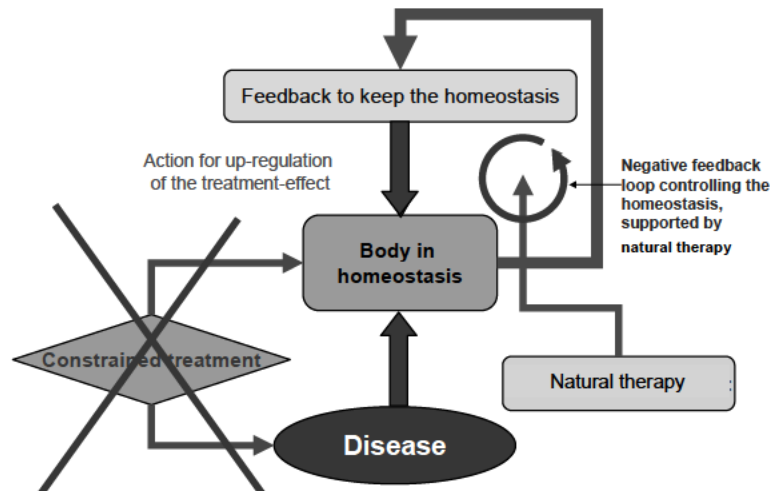
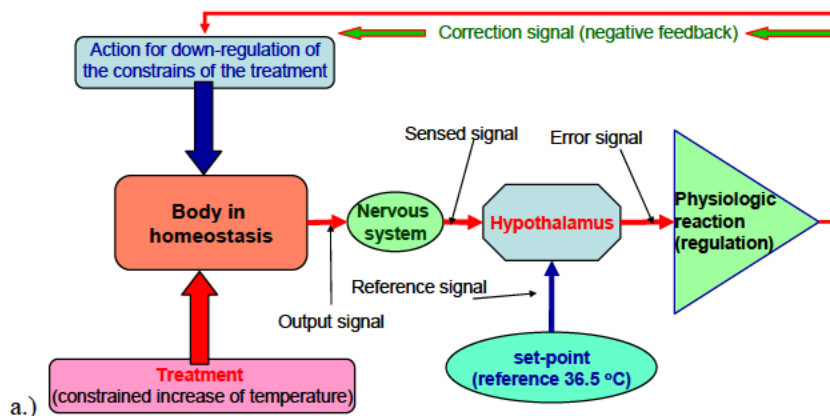


Figure 4. Oncothermia acts differently. It helps the natural feedback loops for natural corrections, and not makes constraints, which induces immediate correction effects from the body by negative feedback protection mechanisms.

The natural therapy helps the homeostatic control, consequently the physiology does not work against this action. The main task is to direct the physiology in the standard way, and act on such normal line. The positive feedback loops (the avalanche effects), which may destroy the normal homeostatic equilibrium, has to be stopped by the therapy.

Let us see an example, the hyperthermia treatment. When the set-point in hypothalamus is normal for temperature regulation, the body controls the physiological actions (like sweating, subcutan capillary blood-flow, heart-rate, etc.) and tries to suppress the effect of the external heating. However, when the set-point is adjusted, the complete physiological reaction-set helps the temperature increase in natural way, (see Figure 5.) [19].



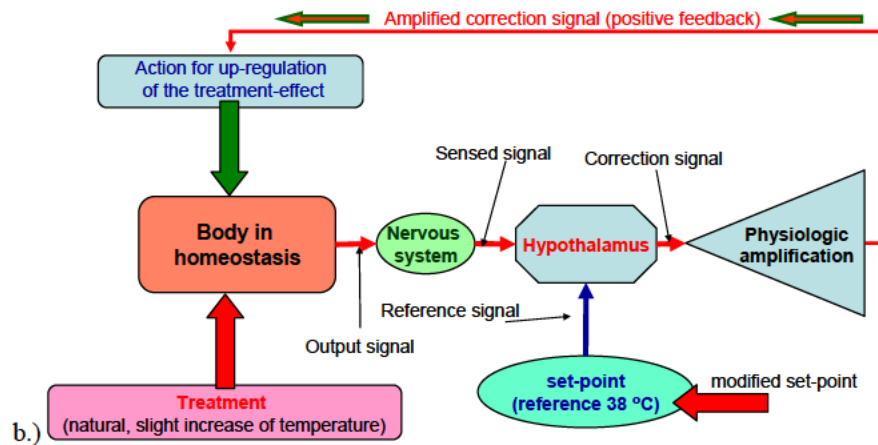


Figure 5. A schematic example of the constrained and natural effects. (a) The constrains in a heat treatment gains negative feedback, the homeostatic regulation works against, tries to down-regulate the effect. (b) By adjusting up the set-point (e.g. natural fever), the homeostatic regulation will upregulate the parameters, helping the natural treatment. (This example is systemic, but the local blood-flow and many locally controlled physiologic parameters work in the same way.)

Due to the negative feedback control the processes are self-controlling, seeking to a definite equilibrium. Resulting of this process no high accuracy of the constrain control is necessary. The homeostatic control is the basic of the fractal physiology, which is applied in oncothermia as essential mechanism, induced with the fractal fluctuation on the modulation of the carrier frequency [21]. This special selection is based on self-organizing behavior of the bio-materials, which is a well-known and widely investigated topic in science [22] and especially in biology [23], as well. The above shown proliferation homeostasis works on the renewing of the cellular system, but one cell has to be annihilated giving place for the new-born one keeping the complete function in equilibrium (homeostasis). The equilibrium of this complex system could be described by fractal physiology [24], [25], [26], [27] and bio-scaling [28], [29], [30]. This complexity is mirrored in the four dimensional description of the living state [31], which is valid in all the scales of the life [32]. It is proven, that the entropy in homeostasis is constant in all scales of the complex system [33].

The complex network of the regulating pairs with opposite actions is the basic of the Traditional Chinese Medicine (TCM) philosophy too (Yin-Yang pairs). The complexity means that the system can not be simple additionally composed from their parts, the parts alone do not carry the function, which they have in the complete complex system. The couplings and interactions between the controlling pairs could explain the multi-functional behavior of the tuning a single controlling pair, so the consequences of one external retuning of the balance could lead to various results.

### Network control of the homeostasis

The mesenchyme, which is 25% of the human body, has important role forming homeostasis of the organism [34]. It is a loose connective tissue with undifferentiated type [35]. The pink-noise with entropy  $S_E=1.8$  characterizes the homeostasis like an intensive parameter. This intensive is valid for every physiologic signals and for all the organs, the  $S_E=1.8$  is an universal constant for the living body.

The cellular functions like supplies and filtering are mediated by the mesenchyme, which represents a transmitter between the blood-capillaries and the cells. The mesenchyme is a ground substance matrix for the cells, it is an ordered set of meshwork of connective species like highly polymerized hydro-carbonates, gucosaminoglycans, ologasacharid-chans connected to proteins, proteoglycans, and structure-glycoproteins, meshing by the dendrites of cellular glycocalix and by the extracellular matrix.

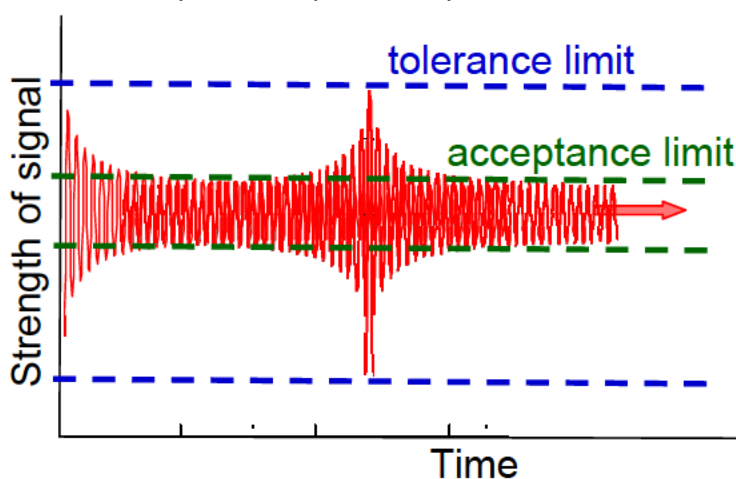


Mesenchyme has a trimodal function: cellular, humoral and neural. The cellular function makes the chemical equilibrium of connective tissue together with reticuloendothelial cells. The humoral function controls the transport processes through the capillaries and lymph-network. This transport mechanism ensures the communication with far away systems. The neural function is responsible for the functional connection with all other parts of the organism. The three levels are different in their ranges: the cellular is local, the humoral is mesoscopic and the neural is global (systemic) interaction in the body. Due to the slow transport processes, the humoral effects are slow, while the neural is speedy.

The information control is effective by assistance of the neural system, of the cellular transport (hormones, enzymes, apoptosis, “social” signals) and of the humoral by blood and lymph transports too. The cell is the quickest to react. All the controlling mechanisms are operation by a pair of opposite signals: up- and down-regulation the actual process. This is valid in all the time-scales having numerous pairs to form the physiological signals. The three levels are connected with each other by the mesenchyme.

The homeostasis is determined by the equilibrium of the large number of opposite pairs. As example, we describe the proliferation homeostasis. There is a mechanism, which replaces the aged, harmed or too stressful cells. This process, which again the equilibrium of the opposite driving forces, stabilizes the final size of the organs. The opposite processes are the annihilation (apoptosis driven by the programmed cell death) and creation (cell division driven by growth factors). The two sides are in equilibrium in healthy state. When this equilibrium vanishes, the system works faulty, that is the illness. When the apoptosis starts to dominate that could be an autoimmune disease, when the creation determines the process, tumor is the result. The complexity of the system (which characterized by the number of the opposing pairs) is the basic of the proper work, allows the system accommodating properly to the environmental challenges. The acting signal-pairs are connected and coupled to each other, forming a unified complex system.

The deterministic way of the control can not be enough accurate and stable, with appropriate processing velocity, so the process is not deterministic. There are a crucial role of the random processes also to make the control optimal, not use unnecessary accuracy and waste energy to control the system. The aim of the homeostasis is safeguard the cellular functions, assure the constant life-conditions for these smallest units. The environmental parameters must kept in a tolerable band, the fluctuations of the actual values must not go over a definite limit for a longer time. These thresholds keeping the average of the parameters constant in time, but due to the given band-width the deviation also must be fixed (see Figure 6.).



*Figure 6. The fluctuations must be in the definite range keeping the control properly. Consequently the average has to be always fixed in time, and the random fluctuations remain in the band for a long-range of the time.*

The structure of fluctuations is essential in this stochastic process. The mesenchyme is the coupling media of the action networks constructing the homeostasis. The mesenchyme is a crossing field of the homeostatic actions working like hubs for various and numerous actions. Modifying the hubs, the homeostatic control could be changed. Three main effects could act:

1. The mesenchyme over-controls. In this case the signal has to be down-regulated, purging is active [36].
2. When the signal is too low, it must be up-regulated, which is the tonization [36].
3. The signal is correct, but its deviation is too large. Then a homeostatic entropy has to be produced at the hubs, [36].

### The human quantum generator

The human body comprises  $10^{14}$  cells, [37] and a singular cell is composed of several millions of giant molecules. The average quantum activity of the human body:  $1.45 \cdot 10^{27}$  photon/cm<sup>3</sup>/s, [38]. The human body radiates not only in the thermal emission range (3 – 10  $\mu$ m), but it emits microwaves in millimetre wavelengths with high intensity as well [39], [40]. Moreover, the radiation is active even in the X-ray range: decay of the radioactive isotopes (<sup>40</sup>K) could be observed [41]. The most frequent chemical processes belonging to each wavelength of the spectrum can be seen on the Figure 7.

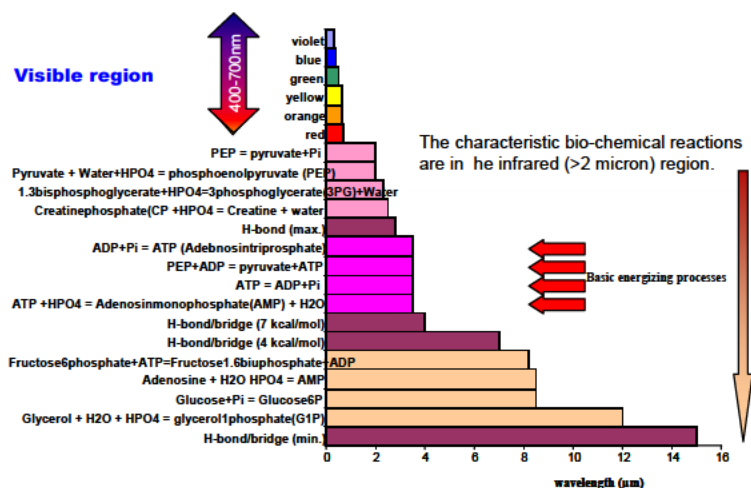


Figure 7. Typical processes of the infrared spectrum in living objects

The utilization of food in accordance with the calometric measurements has 49-50% efficacy. However, if the human organism were a heat engine then the efficacy (calculated the best [42] case) would be:

$$\eta = \left( 1 - \frac{T_{\text{ambient}}}{T_{\text{body}}} \right) 100 = \left( 1 - \frac{300}{310} \right) 100 \approx 3\% \quad (1)$$

Consequently the human organism is not a heat engine, the photons are produced by combustion. All of these facts indicate the human body is not a simple thermal radiator. On the other hand, the human organism comprises highly specialized units: energy generation and its consumption is not necessarily taken on the same place in the body. The main energy-carrier producers in the cells are the mitochondria. Mitochondria produced ATP, is the carrier of the free-energy in the cellular processes, produced  $2 \cdot 10^{26}$  ATP molecules/day [43]. The evolution of energy takes place by the well known hydrolysis of ATP to ADP. The conserved energy carrier is the ATP which energy is converted to instant photon radiation at its hydrolysis. Consequently the energy is carried by these



photons in subsequent steps. ATP transports the energy dominantly by diffusion while the photon makes radiative transmission. In the case of radiation, the photon is absorbed by the actual processes (ionic-pumps or other molecular “motions”) or freely travels and damped after a short length. By absorption its energy transforms into thermal molecular vibrations. Its utilization is inefficient in the human organism (it is not thermal engine). There has to be a secondary energy distribution system, which transports the energy in the non-thermal form. Therefore, the highly developed organisms invented a highly efficient method for the production and transportation of photons or related energy “bags” like solitons [44], [45], [46]. These interactions have a long-range coherence [47], and defined on the dielectric matter [48]. For these processes we have to exclude the possibility of the frequent energy-carrier transformation, and also the energy distribution in the form of photons is supposed. If the energy was transmitted by photon carrier, namely, by radiating electromagnetic field, suitable boundary surfaces (waveguides) have to exist; otherwise the energy diffuses, and will be absorbed. Hence, there we suppose the existence of schemes in the advanced organisms like humans transmitting the energy in the form of electromagnetic waves.

Considering that the ionic conductivity of the human organism is relatively low and the frequencies of the transmitted photons are high, [49], consequently, the boundary conditions have to be satisfied by high dielectric constant. The wave conductors therefore have to be dielectric feeder lines of high polarizability, with extraordinary dielectric properties [50].

Because of the complexity of the human organism photons of different frequencies (e.g. see Figure 7.) are produced. The simultaneous transport, distribution, unification of several photons and the avoidance of not wanted frequencies is possible through the energy transport of solitary-waves, by soliton carriers, [51]. In consequence we guess the antennas and feeder transmission-lines are special means carrying soliton-energy in biological systems, involved in the “social control” [1] of the system.

On the other hand, the good efficiency requires an energy distribution where every “user” gets the photon of adequate energy. This assumes a distribution system according to the frequency and absorption process according to the resonance. All these can be complied also by the transport of soliton carriers. Within the energy distribution system there are subnetworks separated by the frequencies, and evidently those users connect to the system – specialized in this way – which requires the photon on the actual frequency. In consequence there are meridians in the human organisation specialized by frequencies.

## ***Cancer and TCM***

TCM works as diagnostic as well as treatment facility in malignant diseases. Its diagnostic phenomena covers many acupunctural points to measure the balance of the various sub-networks in the complex human body (see Table 1.). The diagnosis of tumors is based mainly on

- Phlegm-Damp
- Liver Qi Stagnation
- Blood Stasis
- Heat Toxicity
- Spleen/Kidney Deficiency
- Qi & Yin Deficiency (Qi & Blood Deficiency)

| TCM diagnostic phenomena and actions for tumor   |  |  |   |  |  |  |
|--|--|--|---|--|--|--|
| Qi & Yin/Blood Deficiency  | Blood  | Blood Stasis   | Heat Toxicity   | Spleen /Kidney   | Phlegm /Damp   | Liver Qi Stagnation  |
| Ren Shen<br>Xi Yang Shen<br>Dang Shen<br>Huang Qi<br>Bai Zhu<br>Fu Ling<br>Huang Jing<br>Shan Yao<br>Dang Gui<br>Bai Shao<br>Gou Qi Zi<br>Shu Di Huang | Nu Zhen Zi<br>Ji Xue Teng<br>Ze He Che<br>Gui Ban Jiao<br>Xuan Shen<br>Sha Shen<br>E Jiao<br>Dan Shen<br>Da Zao<br>Zhi He Shou Wu<br>Long Yan Rou<br>Gan Cao | Dang Gui<br>Chuan Xiong<br>Dan Shen<br>Chi Shao<br>Yi Mu Cao<br>Yue Ji Hua<br>Ling Xiao Hua<br>Tao Ren<br>Hong Hua<br>Ji Xue Teng<br>San Qi<br>Ru Xiang<br>Mo Yao<br>San Leng<br>E Zhu<br>Fu Huang<br>Ma Bian Cao<br>Hu Zhang<br>Zhong Jie Feng<br>Xi Shu<br>Shui Hong Hua Zi<br>Liu Ji Nu<br>Niu Xi<br>Zao Jiao Ci<br>Gui Jian Yu<br>Chuan Shan Jia<br>Tu Bie Chong<br>Shui Zhi<br>Meng Chong<br>Xue Jie<br>Shi Lian Chuan<br>Wu Ling Zhi | Bai Hua She She<br>Jin Yin Hua<br>Ye Ju Hua<br>Lian Qiao<br>Ban Bian Lian<br>Ban Zhi Lian<br>Chong Lou<br>Pu Gong Ying<br>Zi Hua Di Ding<br>Yu Xing Cao<br>Ban Lan Gen<br>Bai Jiang Cao<br>Huang Qin<br>Huang Lian<br>Huang Bai<br>Ku Shen<br>Shan Dou Gen<br>Long Dan Cao<br>Shi Shang Bai<br>Tu Fu Ling<br>Bi Xie<br>Zhi Mu<br>Da Qing Ye<br>Ma Chi Xian<br>Bai Tou Weng<br>Ren Gong Niu Huang<br>Ya Dan Zi<br>Tian Hua Fen | Ren Shen<br>Dang Shen<br>Bai Zhu<br>Fu Ling<br>Huang Qi<br>Shan Yao<br>Gan Cao<br>Rou Gui<br>Rou Cong Rong<br>Yin Yang Hua<br>Tu Si Zi<br>Bu Gu Zhi<br>Ba Ji Tian<br>Gou Qi Zi<br>Nu Zhen Wu<br>He Shou Wu<br>Shu Di Huang<br>Huang Jing<br>Zi He Che<br>Shan Zhu Yu<br>Sheng Di Huang | Gua Lou<br>Zao Jiao Ci<br>Fa Ban Xia<br>Bai Jie Zi<br>Dan Nan Xing<br>Shan Ci Gu<br>Zhe Bei Mu<br>Ting Li Zi<br>Qian Hu<br>Xing Ren<br>Cang Zhu<br>Fu Ling<br>Huo Xiang<br>Pei Lan<br>Yi Yi Ren<br>Che Qian Zi<br>Jin Qian Cao<br>Bi Xie<br>Tong Cao<br>Zhu Ling<br>Mu Gua<br>Du Huo | Chen Pi<br>Ju Ye<br>Zhi Ke<br>Fo Shou<br>Chuan Lian Zi<br>Xiang Fu<br>Xiang Yuan<br>Qing Pi<br>Zhi Shi<br>Mu Xiang<br>Yan Hu Suo<br>Da Fu Pi<br>Yu Jin<br>Pei Lan<br>Da Dou Zi<br>Ba Yue Zha<br>Da Hui Xiang<br>Chen Xiang<br>Hou Po<br>Ding Xiang<br>Bai Dou Kou<br>Mei Gua Hua<br>Gou Qi Zi<br>Jiu Xiang Chong |

| TCM diagnostic phenomena and actions for tumor   |  |  |   |  |   |   |
|--|--|--|---|--|---|---|
| Phlegm /Damp   | Liver Qi Stagnation  | Blood Stasis   | Heat Toxicity   | Spleen /Kidney Deficiency  | Qi & Yin/Blood Deficiency   |   |
| •ST 40<br>•SP 4<br>•LV 2<br>•SP 9<br>•LU 10<br>•HT 3<br>•SJ 5<br>•LI 4<br>•LI 11<br>•UB 20<br>•UB 13<br>•SJ 10<br>•ASHI POINTS | •PC 6<br>•LI 4<br>•ST 36<br>•UB 40<br>•LV 3<br>•UB 22<br>•ST 44<br>•LV 14<br>•GB 34<br>•ASHI | •SP 6<br>•LI 4<br>•SP 10<br>•UB 17<br>•LI 11<br>•UB 40<br>•LU 5<br>•ST 36<br>•UB 20<br>•LV 3<br>•ST 44<br>•LV 14<br>•GB 34<br>•REN 14<br>•UB 22<br>•DU 20<br>•XI CLEFT POINTS<br>•ASHI | •SP 6<br>•LI 4<br>•SP 10<br>•SHI XUAN<br>•LI 1<br>•LU 11<br>•LI 11<br>•UB 40<br>•LU 5<br>•ST 36<br>•LV 3<br>•ST 44<br>•LV 14<br>•GB 34<br>•DU 14<br>•UB 22<br>•ASHI | •ST 36<br>•UB 20<br>•UB 21<br>•REN 12<br>•LI 1<br>•PC 6<br>•SP 4<br>•LV 13<br>•SP 10<br>•UB 23<br>•DU 4<br>•REN 6<br>•LV 3 | •SP 6<br>•ST 36<br>•KD 3<br>•KD 1<br>•UB 23<br>•UB 18<br>•LV 3<br>•KD 6<br>•REN 6<br>•LI 11 | •DU 14<br>•UB 39<br>•UB 17<br>•SP 10<br>•UB 23<br>•REN 4<br>•DU 4<br>•DU 15<br>•UB 11<br>•KD 3<br>•ST 36<br>•UB 20<br>•SP 6<br>•LV 3<br>•REN 6<br>•PC 6<br>•UB 18<br>•UB 21 |

Table 1. The diagnosis facilities of TCM in classical homeostatic balance measurement

The treatment facilities are also very large making again a good synergy basis of oncothermia and TCM. The TCM treatment of tumors concentrate on the

- Phlegm-Damp - Transform Phlegm & Dispel Damp.
- Liver Qi Stagnation – Sooth Liver & Regulate Qi.
- Blood Stasis – Invigorate Blood & Transform Blood Stasis
- Heat Toxicity - Clear Heat & Resolve Toxicity
- Spleen/Kidney Deficiency - Tonify Spleen & Kidney
- Qi & Yin Deficiency (Qi & Blood Deficiency) – Tonify Qi & Yin/Blood

The TCM has special role in cancer treatment strategies by supporting Qi and dispeling pathogenic factors.

The combination of TCM with Western medicine could be active in all the “gold standards; in surgery, in chemotherapy and in radiotherapy. It could be applied before surgery, aiming the

- Improve the body’s ability to withstand surgery.
- Reduce post-operative complications
- Control the development of the disease.
- Benefit postoperative rehabilitation.

TCM makes status applied before surgery as

- supplementing Qi and nourish blood.
- fortifying the spleen & augment Qi.
- enriching and supplementing the liver and kidneys.

TCM can be applied after surgery also. Its goal in these cases is double:

- Reducing the possibility of recurrence and metastasis.
- Create an appropriate condition for future radiotherapy and chemotherapy.

These goals are in complete correspondence with the goals of oncothermia, so again the synergy is actually ready. TCM will do the after surgery applications:

- Tonifying Qi and blood.
- Harmonizing Ying and Wei Qi.
- Harmonizing spleen and stomach.

Furthermore of the surgery combinations, TCM is reducing the side-effects and increasing the effectiveness of radiotherapy and chemotherapies by:

- enhancing the overall results of the treatment
- preventing local constriction and recurrence.
- Reducing toxic reactions and adverse side-effects.
- improving hematopoiesis,
- protecting renal and hepatic functioning.
- Reducing gastro-intestinal side-effects.
- alleviating radiation pneumonitis, proctitis and cystitis.
- Reducing vomiting.
- Increasing immune function
- raising long-term survival rates.

It is again the complete synergy with oncothermia, offering huge number of possibilities apply these methods in synergy.

### ***Immune basic of synergy of Oncothermia with TCM***

Acupuncture and their connective pathways the meridians are ancient Chinese knowledge but it is not understood yet in details [53]. Request of the stable homeostasis of the complex organisms is demanding interdisciplinary approach and new paradigm for the topic. The detecting and reconstructing the deviation from the normal balance of the homeostasis is the basic principle of TCM. The Chinese herbs, the physical (mechanical or electromagnetic acupuncture, acupressure) and mixed forms of heating and diffusion-therapies (moxa therapies) approaches are pointing these problems, and solving it with ancient methods. Oncothermia method (OTM) uses also the deviations from the normal homeostasis for selecting the tumor cells and on this basis ignite natural processes to eliminate them from the system, reestablishing the communication harmony between the cells [54]. This technique [55] is well proven from the laboratory level to the clinical applications [56].

The questions from the quantum generator considerations above directly addressed: what is the wave conductor and how is it fed? Evidently, this can be propagating antennas only, namely, antennas distributed in the whole organism that collect the photons and conduct them to the feeder line. Obviously, these have to be broadband antennas to be found everywhere in order to absorb the least possible photons. The components of the network to be found everywhere are the vascular, lymphatic and nervous system. These have a function of collection and distribution. (The resonance effect of subtle propagating waves is experimentally proven in *Escherichia coli* bacteria system, [57]). Certain co-acting parts of the bio-systems can be regarded as meridians. There is no necessary identify any anatomical structure with this network. Therefore, it is not a separately

specialized network transporting any material, but each living organism could have such a transmission network. (The acupuncture can be used in the veterinary medicine as well, [58].)

The single synergistic parts are connected forming a coherent network [59]. There are connection points where the solitons branch-off or join. These co-acting units – as they are formed from three subsystems – get to the surface of body at certain places, [60]. It is remarkable that these conductions to the skin surface have mostly similar physiologic structure [61], identified as acupuncture points.

If we intervene at these points physically, on the one hand, we are able to couple out or in energy in the system, on the other hand, we can influence the shape of solitons (consequently, the spectrum of photon energy). This method is used by the acupuncture therapy, since, if we carry out the coupling in or out of energy in the points of the suitable meridian then we are able to influence the energy exchange. Next, we are going to examine how are the co-acting units established and what is the system model.

Between the acupuncture points to be found on the same meridian the electric resistance is lower than between the points outside, [62], [63].

There are points where the concurrent clusters of the circulatory, lymphatic and nervous systems being in synergy get together to the surface of skin [61]. Their structure is very similar. Moreover, these points are different from the other points of skin surface regarding their physical properties. The different features are as follows: lower electric impedance, carbon dioxide production, infrared radiation [64].

The lower impedance follows from the wave-conduction property. It is evident that the wave propagates in the range of lower wave resistance. The intensive infrared radiation indicates the feeder-line nature and its loss. The feeder line emits here the inevitably dissipating energy. The intensive infrared radiation makes the cells of skin surface to have a higher metabolism level. Probably, this is the reason of the higher CO<sub>2</sub> emission. It can be imagined as well that we might speak about a simple control of energy emission as the carbon dioxide is an infrared reflector. Long time ago we did not wear clothes, therefore, we had a very sensitive energy-emission control system in which the acupuncture points – forming the part of the system – operated as intensive emission places. The emission was controlled in these by means of carbon dioxide production, namely by a chemical process. We may conclude this part: energy distribution system has numerous points through which the energy system can be controlled very exactly and sensitively.

An extended network approach was presented in the topic [65], and we would like to continue our research on this basis. The *in silico* studies will have their roots from the network analysis together with the modern fluctuation theory for complex living organisms (fractal-physiology) was developed in the last decades to study this complexity: like self-organization ([66], [67], [68], [69]), fractal physiology ([70], [71], [72], [73]), and the bioscaling ([74], [75], [76]). Oncothermia widely using these new scientific results [77], [78]; as well as the resonance phenomenon is studied and used in the light of a new theory [79], and special vector-potential theory [80], [81], [82] helps to complete the method. The problems of the thermal limit in the deep-seated tissues is theoretically [83] and experimentally [84] solved, so it has no any barrier for the wide investigations in synergy experiments. TCM involves electro-acupuncture and laser acupuncture, which are similar in their electromagnetic (conductive) approach to oncothermia effects. We studied the network control in acupuncture and connected it with the fractal physiology approach, used essentially in oncothermia applications. The network is recognized as scale independent and so well generalized for all the living structures.

The outer connection points for this control are probable the acupunctural points. The living systems are energetically open, they are strongly connected to their environment. The special material exchange in the acupunctural points (CO<sub>2</sub> development [85], temperature differences [86],

potential differences [87]), as well as the change of the size [88] of the acupunctural point support the assumption that these connections are controlling hubs in the complex system.

The stimuli of the acupunctural points (controlling the active fluctuations in the homeostatic band) could be achieved by various methods, like invasive needles, like electric or laser stimuli or mechanical pressure. We do not know yet the actual local processes induced by the stimuli, but probable the mechanical and electric factors make the disturbance which promotes the natural correction system to reestablish the homeostatic equilibrium. Probable there is no single effect could be named for action, but various local disorders are conflicting, like micro-wounds making injury current, like micro-bleeding inducing platelet-derived growth-factors (PDGF), like forced cellular apoptosis and replacing division, etc. Irrespective of the realized ways of the action, the acupuncture is probable giving enough disturbances to rearrange the structure of the local hub for finding the homeostatic equilibrium again by self-organizing way. This is much similar to the process, when we give mechanical vibration for a bowl of cherries to arrange itself to a lower energy status with self-organization way (see Figure 8.). The stimuli are active till the micro-disturbance exists [89], [36]. There are examples for the stochastic disturbance inducing self-organized processes in the bioprocesses.

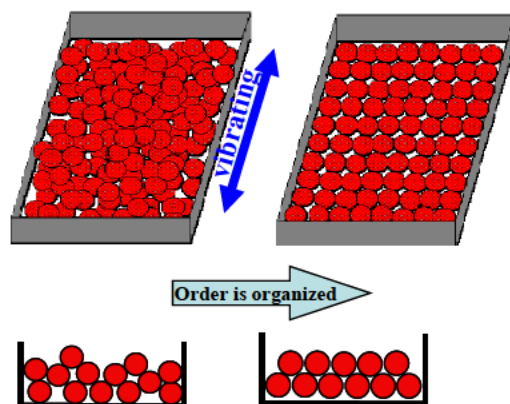


Figure 8. Mechanical self-organization by vibrative disturbance.

Forming the secondary, ternary and fourth structures of proteins operated by self-organizing way [90], and one of the functions of stress-induced proteins (heat-shock proteins, HSP) is providing such disturbances for the stress-unfolded portents where the molecules could find the lower energy state forming their normal structure again [91].

There are many well proven effect to show the immune action of TCM, which could be well harmonized and supported by the oncothermia immune stimulative and immune activation effects. The classical needle and newer electro-acupuncture of humans (Tables 2. and 3.) and on animals (Tables 4. and 5.) show the proofs

| Immune action  | Effect/action | References             |
|----------------|---------------|------------------------|
| Macrophages    | promoter      | [92], [93]             |
| Neutrophils    | promoter      | [94], [95], [92]       |
| Neutrophils    | no effect     | [96]                   |
| NK-cells       | promoter      | [97], [98], [92], [93] |
| Lymphocytes    | promoter      | [92], [93]             |
| Lymphocytes    | suppressor    | [99]                   |
| Immunoglobulin | suppressor    | [100], [101]           |
| Immunoglobulin | promoter      | [102]                  |
| Immunoglobulin | no effect     | [103], [104]           |

Table 2. Immune effects of acupuncture in humans

| Immune action | Effect/action | References |
|---------------|---------------|------------|
| NK-cells      | no effect     | [105]      |

Table 3. Immune effects of electro-acupuncture in humans

| Immune action  | Effect/action | References |
|----------------|---------------|------------|
| Macrophages    | promoter      | [106]      |
| Neutrophils    | promoter      | [107]      |
| NK-cells       | promoter      | [108]      |
| Lymphocytes    | promoter      | [108]      |
| Immunoglobulin | promoter      | [109]      |

Table 4. Immune effects of acupuncture in animals

| Immune action  | Effect/action | References                        |
|----------------|---------------|-----------------------------------|
| Macrophages    | suppressor    | [110], [111]                      |
| Macrophages    | no effect     | [112]                             |
| NK-cells       | promoter      | [113], [114], [115], [116], [117] |
| Lymphocytes    | suppressor    | [118], [119]                      |
| Lymphocytes    | promoter      | [120]                             |
| Immunoglobulin | suppressor    | [118]                             |

Table 5. Immune effects of electro-acupuncture in animals

These facts are also in complete harmony of the oncothermia immune stimulation and absopal effects. The herbal supports of the TCM offers also a great synergy potential. Many herbs applied in TCM are immune supporters and trying to rebalance the lost homeostatic control. One of the most known herbal application is the ginseng, which effect of Ginseng on tumor-suppression was shown as connected to Nrf2 [121] in prevention (see Figure 9. and 10.). The nuclear factor (erythroid-derived 2)-like 2, (Nrf2), is a transcription factor that in humans is encoded by the NFE2L2 gene. [122]. NFE2L2 induces the expression of various genes including those that encode for several antioxidant enzymes, and it may play a physiological role in the regulation of oxidative stress. The proven stimuli of the Nrf2 is a very promising possibility of the TCM and oncothermia synergy.

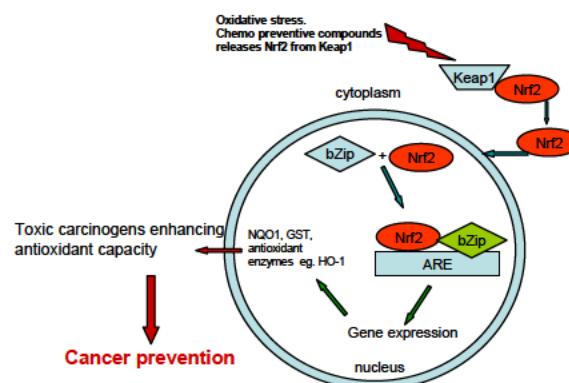


Figure 9. Cancer prevention way by Nrf2



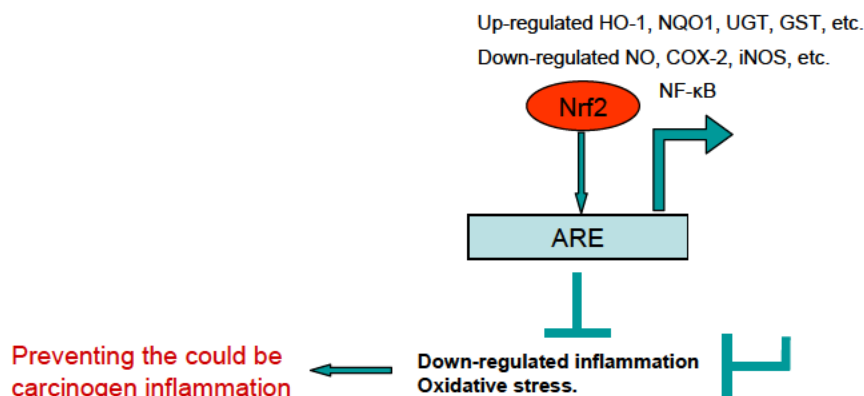


Figure 10. The role of Nrf2 in chemoprevention. When Nrf2 has a dysfunction, that makes prolonged inflammation and oxidative stress, leading to genetic instability, and at the end to cancer

Extracts from the Roots of *Lindera strychnifolia* Induces Apoptosis in Lung Cancer Cells, which was experimentally investigated by immunohistochemical staining of PCNA and TUNEL in LL-2 cell s.c transplanted in mice [123]. At 1 week before transplantation of LL-2 cancer cells, mice received *L. strychnifolia* extracted solution daily until the end of the experiment. At 35 days after *L. strychnifolia* treatment, tumors were resected and examined histologically (n = 11/group). The typical immunohistochemical appearance (PCNA and TUNEL) in tumor tissues from mice of control and *L. strychnifolia* extract (5.0 mg/ml) treated mice well shows the difference. Cell proliferation and apoptosis were detected using anti-PCNA antibody and a modified TUNEL method, respectively. Change in PCNA-positive and TUNEL-positive cell number in the tumor tissue PCNA control 50% dropped to 20% ( $p < 0.01$ ), and TUNEL control increased from 20% to 50% ( $p < 0.01$ ).

## Proposal

There are various TCM substances acting palliative or curative on tumorous diseases. For example of pain reduction the “*Senecio palmatus*”. For curative treatments special moxibustion techniques with various complex mixture of herbs could be applied [124]. Synergetic effects of the oncothermia and TCM is expected due to the well targeted tumor-tissue by oncothermia in combination with the effective TCM like Tongyou-sum plant. Also the effect of ginseng and its Nrf2 cancer preventive action with oncothermia is investigated, and generally the apoptotic possibilities for various TCM herbs. The effect of synergy will be investigated by in silico, in vitro and in vivo experiments, using special oncothermia device for laboratory use (EHY110, Oncotherm). The latest histomorphological and immunohistochemical methods will be used for evaluation,; mainly concentrating on p53 tumor-suppressor protein and the apoptotic pathways, including beta-catenin. Protocols of clinical studies will be worked out on the basis of the experimental results.

Potential of the synergy of high-tech oncothermia and TCM is extremely huge. We are ready to work out the European alternative of the “East meets West in cancer care collaboration” [125] on the basis of the widely applied TCM evidences [126].

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