

Electronic transmission of nonlocal suppressive effect of Chinese herbal medicine to *Escherichia coli*

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Abstract

A number of nonlocal biological effect of chemicals were reported in recent years. In this study, we examined nonlocal effect of two antibacterial Chinese medicinal herbs (*Houttuynia cordata* Thunb and *Sargentodoxa cuneata*) on the growth of *Escherichia coli*. The processed herbs were placed on the transmission side of a commercially available scalar wave device, and the *E. coli* cultured on triplicate agar plates on the receiver side. Growth suppression was evaluated by Colony Forming Unit (CFU) determination in comparison to the control group. A significant nonlocal inhibitory effect (up to 30%) was demonstrated for the treatment group ($p < 0.05$), indicating a success in transmitting the antibacterial function of the herbs to the *E. coli* cultures. Factors affecting the success rate were explored.

Introduction

Energy medicine provides a new medical choice for patients and holds great promise for its non-invasive nature [1]. From the perspective of physics, all lives depend upon the molecular interacting via vibrating energy fields as molecules, atoms, electrons, and chemical bonds all have their vibration characteristics [2]. For the past twenty years, many studies have demonstrated the feasibility of nonlocal effects on the viabilities of microorganism via electronic transmission of the information from the targeting molecules [3-6]. Compared with non-thermal inactivation technologies through the direct effect of electromagnetic field [7], the electronic transmission of nonlocal effect depends on the signals of the special chemical drugs [3,6].

To date, most of the effective experimental results were based on the relative simple chemical molecule and antibiotics, such as: acetic acid [8], phorbol-myristate acetate [9], retinoic acid [3], ampicillin [5], vancomycin [4], penicillin [1] and clotrimazole [6]. Some of the electronic information delivery was mediated through aqueous system [1,4,5] which is believed to be able to generate dissipative nanostructures when induced by exogenous physical fields, providing basis for storing and retrieving biologic information [3]. Other studies showed that the electronic transmission did not depend upon the aqueous system; instead, it utilized special antennas from both the molecules on the transmission side and the biological organisms on the receiver side [6,10,11].

There is only very limited amount of work conducted in this area of nonlocal effect so far even though it's a very important phenomenon to explore. More scientific evidence is needed to make advance in this field, and the attempt to explain the mechanism of this effect will allow us to better understand the correlation of matter, information and energy.

In this study, we used two antibacterial Chinese herbal medicines as source of signals to evaluate the electronic transmission of nonlocal effects of more complex and non-artificial synthetic substance. *Houttuynia cordata* Thunb and *Sargentodoxa cuneata* were chosen, as both have well-documented antibacterial effects [12,13]. For the signal

transmission, a commercially available device was used, which was reported to be able to transfer specific molecular signals onto target cells through scalar waves [6,10]. Furthermore, the different physical properties (liquid or solid) of the source material were compared to understand whether the electronic transmission of nonlocal effects was aqueous system dependent.

Materials and methods

Chinese herb material and preparation of extracts

The Chinese herbal medicine of *Houttuynia cordata* Thunb and *Sargentodoxa cuneata* were purchased at Chinese medicine store (Tongrentang chain-store). The dried *H. cordata* (25 g) and *S. cuneata* (25 g) were extracted with boiling water for 2 h and filtered through a 0.45 μm filter (Osmonics, Minnetonka, MN, USA), followed by freeze-drying yielding a fine powder as the final product to be stored at 4°C.

The direct inhibitory effect was tested by introducing different concentrations of the medicine in the range of 125-10000 $\mu\text{g}/\text{mL}$ to the culture medium, followed by cell count determination after incubation for 1 h at 37°C. The concentration that can achieve 100% inhibition of growth was used for the subsequent nonlocal experiments.

The nonlocal inhibitory effect was examined by using two sources, with the first one being a 5 ml of diluted solution of the processed herbs at the concentration of 1250 $\mu\text{g}/\text{mL}$ (Source A), and the second one 1g of dried power (Source B).

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Bacteria and preparation

E. coli strain DH5 α (obtained from the Institute of ENNOVA Life Science and Technology) was used for this study. The strain was maintained in Luria–Bertani (LB) medium (1.5% agar) at 4°C in the freezer. For each set of experiment, it was taken from freezer and expanded in a 50 ml Erlenmeyer flask containing 30 ml of LB liquid medium (yeast extract 5 g/L, peptone 10 g/L, NaCl 10 g/L, pH 7.0) by placing on a rotary shaking incubator set at 200 rpm and 37°C for 12 h. This process ensured that bacteria were activated into the exponential growth stage to be used as inoculum for subsequent experiments.

Electronic transmission of Chinese herbal medicine property

Scalar wave experimental kit was purchased from Germany. As shown in Figure 1, this device consists of two capacitor plates (flat Tesla coils) with ball electrodes connected by a cable, one working as transmitter and the other receiver. The transmitter is run by a frequency generator which can be modulated in amplitude. At a particular frequency, self-resonance between the transmitter and receiver can be achieved. In our experiments, the resonant frequency varied between 4.3 and 4.7 MHz, and more detailed descriptions were provided by Myle et al. [6].

Evaluation of suppressive effect of electronic transmission signals

During the exposure experiments, the Chinese herb extract (source A or source B) was placed on the transmitter and the biological target (bacterial plates) on the receiver to assess the nonlocal biological effects. The exposure time was 4 h and 48 h respectively, and the temperature was set at 31°C.

To prepare the bacterial plates, the activated cells of *E. coli* were spread on LB agar medium in plastic petri dishes at a density of 150~200 cells/dish. Cell viability was determined by counting the colony forming units (CFU) where the suppressive effect was evaluated as a percentage of the control group, which were set up under the same condition but with no irradiation from the device. Blanks were samples placed on the receiver side of the device with no medicine on the transmission side, which was used to evaluate the effect of the device alone. Each exposure experiment was independently repeated for three times. A one-way ANOVA test was performed for the data analysis.

Reagents used

Peptone, yeast extract, agar (Sigma, USA), and other reagents of analytical grade (Tianjin Fengchuan Chemical Reagent Co., Ltd., China) were used.

Results

Direct antibacterial effect of *H. cordata* and *S. cuneata*

As shown in Table 1, the extract of *H. cordata* and *S. cuneata* can inhibit the growth of *E. coli* effectively, with the inhibition rate increasing with the concentration of the medicine. At the concentration of 1250 $\mu\text{g/mL}$, a nearly 100% inhibitory effect was obtained.

Nonlocal antibacterial effect of *H. cordata* and *S. cuneata*

As shown in Figure 2, a nonlocal inhibitory effect of *H. cordata* and *S. cuneata* was achieved for source B, with cell viability decreased by 27% ($p < 0.01$) compared to the non-irradiated control group. However, there was no significant change ($P > 0.05$) observed for the group exposed to the information of source A, despite the fact that a near 100% of growth

inhibition was observed under the direct chemical influence of source A (Table 1). This result showed that nonlocal suppressive effect of electro-transferred medicine was depended on the physical properties of the information source. No significant difference between the blank group and the control group was observed, indicating receiving the electronic transmission alone could not inhibit bacterial growth.

Compared to the direct contact of the medicine, the nonlocal antibacterial function takes much longer time to take effect. As shown in Figure 3, no significant inhibition was observed for exposure to the source B signal for 4 h, and only under the long exposure time with electro-transferred Chinese herb signal, a significant nonlocal suppressive effect (up to 27%) was obtained. Without the coupling of the electromagnetic signal of the medicine, the “blank” electronic transmission field did not affect the cell growth regardless of the exposure time. Therefore, the electronic transmission of nonlocal suppressive effects, unlike regular direct chemical antibacterial effect, requires an accumulation process.

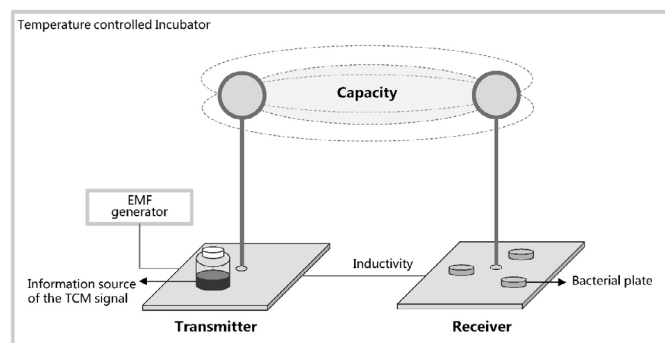


Figure 1. Schematic representation of the electronic transmission setup

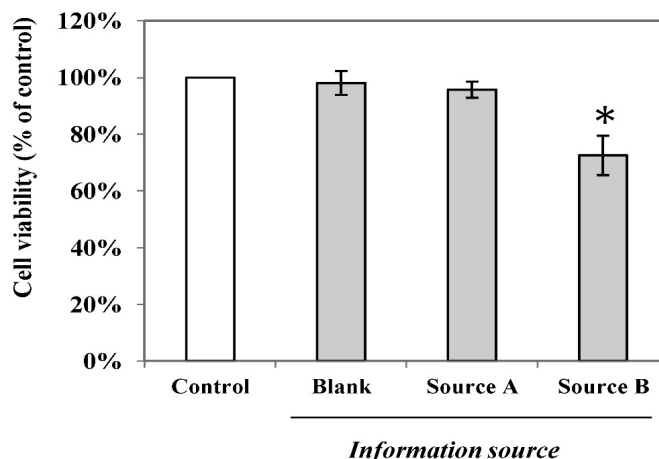


Figure 2. Cell viability of *E. coli* exposed to the electronic transmission of different information source. Values reported as percentages of the control group. Star indicating a value significantly different from the control group (* $p < 0.01$)

Table 1. Direct inhibitory effect of different concentrations of *H. cordata* and *S. cuneata* on the growth of *E. coli*

| Exposure concentration ($\mu\text{g/mL}$)* | 10 000 | 5 000 | 2 500 | 1 250 | 500 | 250 | 125 |
|--|--------|-------|-------|-------|-----|-----|-----|
| Growth inhibition percentage (%) | 100% | 100% | 100% | 96% | 80% | 72% | 38% |

*Control group plate was regular LB agar; Treated group plates were prepared by regular LB agar with different concentrations of *H. cordata* and *S. cuneata*.

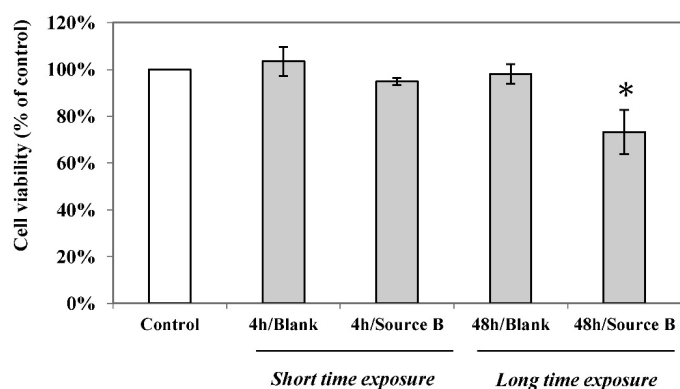


Figure 3. Cell viability of *E. coli* exposed to different time under the electronic transmission of source B. Values reported as percentages of the control group. Star indicating a value significantly different from the control group (* $p < 0.01$)

Discussion

The antibacterial effect of *H. cordata* and *S. cuneata* was well documented [12,13], which are known to work in synergy and therefore often prescribed in pairs by Chinese Medicine practitioners. For this study, the mixed extract of these two herbs exhibited very effective inhibition to the growth of *E. coli* even at a low concentration (e.g. 1250 $\mu\text{g/ml}$). However, this is the first time that a nonlocal antibacterial effect of these two herbs was reported.

A number of studies reported that all chemicals have an intrinsic electromagnetic signature that carries the information and function of the molecule, and furthermore, the information and function can be separated from the molecules and transferred *via* physical fields [14-17]. In this study, the antibacterial properties of *H. cordata* and *S. cuneata* were successfully transferred to the *E. coli* cells, leading to significant growth suppression. The chemical makeup of these two herbs are very complex, including various compounds such as volatile oils, organic acids, flavonoids (quercetin, isoquercitrin, afzelin, hyperin, reyoutrin, rutin), and water-soluble polysaccharides [18], among which the flavonoids contain many ring structures therefore potentially functioning as “loop antenna” to facilitate the transferring of chemical information [6].

Water is believed to play a critical role in information transferring and storing [16,17,19,20]. For this work, source A, a diluted solution of *H. cordata* and *S. cuneata*, failed to yield a nonlocal effect, and while source B, the dried powder, achieved the inhibitory effect, which could be explained that 1. water may interfere with the information transfer of the molecules and 2. a desired dosage is required for the success of information transferring. More work needs to be done to better understand the mechanism behind this matter.

Unlike the direct contact taking effect much faster, the nonlocal effect seemed to be an accumulative process as a four-hour exposure to the signal of the herbs did not affect the growth while a 48 h exposure caused significant growth reduction of *E. coli*. In addition, the potency of the transferred information seemed to be lower compared to the chemicals, which is comparable to the finding by Ebbers and Myle [6] that the information transfer of clotrimazole by scalar wave is about half as effective as the direct chemical drug application on the growth of yeast.

Conclusion

A nonlocal inhibitory effect of two Chinese Medicine herbs, *H. cordata* and *S. cuneata*, on the growth of *E. coli* was demonstrated by

electronically transmitting the information of the extracted herbs. The “information” of the material was transferred without the mediation of water. On the other hand, the medicine dissolved in water as the source of information did not achieve information transfer, and the reasons behind this need to be further explored.

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Author contributions

The authors Yu Chen and Zhong Zhen Cai contributed equally to this work; Methodology: Xuemei Bai, Yu Chen, Peng Gao and Zhong Zhen Cai; Data Curation: Yu Chen; Investigation: Yu Chen, Zhong Zhen Cai, Peng Gao and Qian Feng; Writing-Original Draft Preparation: Yu Chen, Xuemei Bai; Supervision: Xuemei Bai, Bruce Q. Tang.

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