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ORIGINAL PAPER

Delayed luminescence of high homeopathic potencies on sugar globuli

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Delayed luminescence signals of *Arg.met.* CMf (100Mf), *Canth.* CMf, *Bov.* CMf absorbed onto sugar globuli was observed by exciting them at their known resonance frequency of 2.060 MHz. *Arn.* CMf also showed delayed luminescence when excited at 2.060 MHz and at 1.828 MHz. *Alc.* LMK (50MK) could not be excited by 2.060 MHz and showed properties of control globuli. *Canth.* LMK could not be excited at 2.006 MHz.
The delayed luminescence signals were characterized by the coefficient B_2 typical of the delayed luminescence of non-living complex systems, and by the coefficient B_0 typical of living systems. Both coefficients can be considered as indicative of holistic quantum structures in homeopathic potencies. *Homeopathy* (2008) **97**, 134–140.

Keywords: Quantum structure; Holistic photons; Characteristic frequencies; Electromagnetic fields; Homeopathic photons; Delayed luminescence

Introduction

In previous work Lenger reported the effect of high-frequency magnetic fields on homeopathic medicines in the form of sugar globuli.[1] In a large Faraday cage, the damping of the magnetic field of different Tesla Coils driven by frequencies of 2.060 MHz or 6.9 MHz, when medicated sugar globuli in high potencies were placed in the maximum of the coils' magnetic field, was observed. The damping of the magnetic fields was observed using homeopathic medicines at 2.060 MHz with: *Argentum metallicum* CMf (*Fincke*), *Bovista* CMf (*Fincke*), and *Cantharis* CMf (*Fincke*), and 6.9 MHz (*Arg. met.* CMf, *Canth.* CMf). It was shown that high homeopathic potencies have more than two resonance frequencies in the MHz region. Each resonance frequency can be used to excite the complete spectrum of a remedy. By an increase of the exciting magnetic field the homeopathic photons could be separated from the medicated sugar globuli. The magnitude of the field of separation is a characteristic constant for measuring the heights of different potencies.

Some workers believe that homeopathy involves an interaction between the resonance of a frequency of the remedy and the frequency of the disease or diseased system.[2,3] The characteristic frequencies of the medicines and of diseases or diseased systems have not been determined. The detection of characteristic frequencies of a few cell lines by physical methods has been reported.[3]

Delayed luminescence is the phenomenon of photon emission by a complex living system after exposure to white light for a few seconds.[4] The photon signal is observed after a few milliseconds delay and is observable for a few minutes. The delay of few milliseconds is sufficient to eliminate the contribution of fluorescence caused by exposure to light. The intensity of a delayed luminescence signal is weaker than the intensity expected in a forbidden transition but stronger than blackbody radiation. The signal cannot be attributed to phosphorescence as it is observable in almost all living systems. Popp[4] and Bajpai et al.[5] have developed a method for determining holistic attributes of living systems. A living system is stimulated by visible light for few seconds and the delayed luminescence emitted by the system is measured after of 10 ms using a photomultiplier detector (PMS) sensitive in the range of 300–850 nm. The delayed signal has a characteristic shape: it first decays non-exponentially and then becomes non-decaying.

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Holistic attributes are obtained from the shape of the signal in the decaying region and from the fluctuation in the non-decaying component. Bajpai has shown that the shape of the signal in the damped harmonic oscillator model of Popp can be analyzed in terms of four parameters: B_0, B_1, B_2 and t_0. I applied the methods of Popp[4] and Bajpai et al.[5] for the analysis and characterization of homeopathic medicines, non-living systems, in comparison with control globuli.

The decay shape indicates coherence in time in the photon signal. Popp[4] concretized the time coherence in a phenomenological model that attributes the decay shape to dynamical behaviour of photons given by a frequency stable damped harmonic oscillator with time dependent damping and mass terms. Popp suggested the following Hamiltonian for the dynamics[4,5]:

$$H(p,q) = \frac{p^2}{(1+\lambda t)^2} + \frac{1}{2}(1+\lambda t)^2 \omega^2 q^2$$

where p and q are the usual canonical conjugated electromagnetic field variables of mode frequency ω, λ is the damping coefficient and t is time. The amplitude of its classical solution decays hyperbolically with time and its energy is proportional to the square of its amplitude. Bajpai et al.[5] solved this problem in the quantum framework and found that quantum state of the above oscillator is a squeezed state[6] that evolves in time. The evolution changes the number of photons in the field with time, which is observed as the shape of the signal. The number of photons in the squeezed state in small interval Δt around the time t is equal to $n(t)\Delta t$. The calculated value of $n(t)$ in the quantum dynamics is[5]

$$n(t) = B_0 + \frac{B_1}{(t+t_0)} + \frac{B_2}{(t+t_0)^2}$$

where B_0, B_1, B_2 are coefficients representing analytical expressions and t_0 is the inverse of damping coefficient. The coefficients depend on initial conditions and parameters of the Hamiltonian. All coefficients are real and positive, as is t_0. The coefficients and t_0 characterize a delayed luminescence signal and can be determined from the observed shape of a signal by non-linear minimization. The delayed luminescence signals of living systems can be correctly described in the quantum framework but not in the classical framework. The quantum nature is confirmed in a few signals by measuring the probability of zero photon detection in a small interval as the average number of photons detected in the interval falls to zero. We shall, therefore, take a signal to be quantum if its shape lacks exponential decay character and is correctly described by four parameters in the quantum framework.

A photon signal contains information about its emitting system in its various properties. The time coherence of photons in a delayed luminescence signal implies a coherent structure in the living system emitting the signal. The quantum nature of the signal implies quantum nature of the coherent structure. The four parameters of the signal are related to attributes of the coherent structure. These attributes as well as the quantum state of the coherent structure are currently unknown. We can at present only resort to a phenomenological study of four parameters in living systems. The study indicates that parameter t_0 measures the capability of the system to retain electromagnetic energy. It is an expected result as t_0 is the inverse of damping coefficient. The classical solution describes the shape with one parameter, similar to B_2. The contribution of B_2 will, therefore, be called classical. The quantum solution has in addition two other parameters, whose contributions will be called quantum corrections. The contribution of B_0 is like background noise. It is small and is and comparable to background noise. The contribution of B_1, if present, is substantial and easily measurable.

It is our experience that B_2 is larger than B_1 in signals of non-living systems while the reverse is true in signals of living systems.[5,6] Both B_1 and B_2 are well determined in the analysis and are sensitive to many factors characterizing the emitting system. We find B_1/B_2 to be a more sensitive parameter for differentiating small changes in these factors in living systems. This new parameter determines the decay shape of a signal and will be called shape parameter. We can envisage differing coherent structures in complex systems of medicated sugar globuli. The differing coherent structures give rise to subtle differences in the shapes of delayed luminescence signals. Our analysis quantifies these differences. Significant differences in the parameters of delayed luminescence signals emitted by control and medicated sugar globuli demonstrate the existence of differing coherent structures in them.

Materials and methods

Our measuring system has been previously described.[7] It essentially consists of a light source, a measuring chamber and a PMS. The light source is an incandescent bulb emitting white light. The measuring chamber is more than 1 cm thick metallic chamber with two shutter-operated windows in its adjacent walls. Visible light from the source lamp falls on a sample placed in the measuring chamber. The duration of exposure of the sample is controllable.

Photons emitted by the sample travel towards a detector after passing through the other window. The detector is a broadband photomultiplier tube. It is sensitive in the range of 300–850 nm and operates on single photon counting mode. It counts the number of photons detected in bins of adjustable size. A sample is placed at a fixed location inside the measuring chamber in a sample holder. The temperature of 25°C at the location is fixed by an external control device having an accuracy of 1°C. The sample holder is a quartz cuvette, dimensions 2 cm × 2 cm × 5 cm, mass 12.23 g.

We tried to simulate the condition of resonance according to my previous work[1] by supplying a copper wire wound 20 times around the measuring chamber with an alternating voltage of 2.060 MHz and 50 mV for generating a magnetic field inside the chamber. In other experiments a small coil was used inside the chamber and yielded similar results to the coil outside the chamber. Therefore, we used routinely the coil outside the chamber for our measurements. The frequency of the oscillator in