Biophoton emission from patients with a cold

Changhoon LEE¹, Joon-Mo YANG¹, Seung-Ho Yi¹, Hyun-Joo CHO², Myoung-Ja KANG²
Jong-Soo YANG¹ and Kwang-Sup SOH¹
¹School of Physics, Seoul National Univ. (Seoul, Korea)
²Conmaul Oriental Hospital (Seoul, Korea)

Abstract: We measured biophotons from the palm and dorsum of left and right hands of ten cold patients. The quantity of biophotons was not balanced and the overall trend changed according to the symptom of the patients. After they had recovered from their cold, the biophoton emission rates were also balanced. This suggests that the state of a patient can be monitored more accurately based on biophoton measurement.

Keywords: biophoton, cold, human hand, diagnosis, Yin, Yang, imbalance

1. Introduction

Living things radiate light at an intensity of about 10⁻¹⁵ W/cm²¹ and in the spectral range from UV to NIR of 200 - 800 nm². The light was introduced by A. Gurwitch in the 1920's and has been known as biophoton³. The invention of photomultiplier tube (PMT) has boosted biophoton research and, currently, many groups are working in the field of biophoton⁴⁻⁵. Biophotons can reflect the state of a living organism and can be one of its physiological indicators. Biophotons are related to the basic mechanism of physiological phenomena, especially cell differentiation and development, the healing of wounds, and embryology⁶⁻⁹. Among the various applications of biophoton measurement, medical diagnosis is particularly promising. Recently, biophoton emission from human skin and biophoton variation with change of mental state have been studied¹⁰⁻¹³,¹⁴. Biophoton emission from various areas of the human body has also been explored by Cohen and Popp¹⁴. A characteristic study on the periodic change of biophoton rate over the long terms¹⁵ and its application to the health index have been reported by van Wijk et al.¹⁶.

In this paper, we measured biophotons from the palm and dorsum of both hands of ten common cold sufferers. According to traditional Chinese medicine (TCM) based on Yin/Yang theory, an imbalance of Yin and Yang can cause diseases. And the common cold is known to be one of these diseases originating from this imbalance. Our previous experiment found that paralysis patients showed a serious imbalance in biophoton emission rate from both hands¹⁰. Based on this fact, we conjectured that patients with a common cold might show a similar imbalance. In order to confirm our hypothesis, we measured biophotons from left and right hands by employing two PMTs and analyzed the results using basic statistical methods.

2. Method and Procedure

We used two Hamamatsu R331-05 head on PMTs (Selected for lower dark count) for photon count detectors. The photocathode was made of bialkali and its detection range was 300 nm to 650 nm. This detector had its maximum response at 420 nm with a quantum efficiency of 28 %. The effective detection area was about 46 mm in diameter so that it could cover the central part of the palm and dorsum of a human hand. The PMT was equipped with a magnetic shield (E989-05, Hamamatsu). The dark count at 296 K was about 15 counts per second (cps) at 1700 V. No forced cooling system was used for the PMT. The detector was always stored in a dark room to maintain its optimum performance. A quartz window was installed for protecting the PMT head from direct exposure to dust and moisture. An adaptor was attached at the rim of a PMT housing for placing hands and isolating the heat transfer from the hands to the PMT. Since the dark count was highly sensitive to temperature, the room temperature was kept at 22 ± 1°C.

The distance between the specimen and the surface of the photocathode of the PMT was about 15 mm. Output from the PMT went to a
preamp (C6865, Hamamatsu) through a BNC cable. The preamp was connected to a photon counting board (M8784, Hamamatsu) in a PC. We used an operating software provided by the manufacturer. Each PMT was located in a wooden dark box which had a fan on the upper side to provide ventilation. One side of the box had an opening so that a hand could be inserted for biophoton measurement. The inside walls were covered by black styrofoam which was found to have negligible luminescence in the detection range of the PMT. A piece of cloth covered the outside of the opening to block any stray light going into the dark chamber. On one wall of the box, there was a feedthrough for the simultaneous measurements of such variables as temperature and heart rate. Two dark boxes were separated by 30 cm to make the subjects comfortable. The dark boxes were installed on a wooden desk and the subjects could sit on a chair in front of the desk for measurement. As shown in Fig 1, the dark chamber is made of metal for electromagnetic shield and its dimensions were 1.5 m (W) × 2.5 m (L) × 2 m (H). In order to control temperature and humidity inside the chamber, a ventilation system was employed. The atmosphere inside the chamber was set to the same level as an ordinary room-air environment. It also made long term experiments possible. An audio system was provided for communication between those inside and outside the chamber. The rest of the electronic setup was located outside of the chamber. Data acquisition was done by a program based on LabVIEW. The dark chamber was placed in a dark room in which the subjects could adapt to the darkness. The humidity of the room was maintained at 40%. Music can be provided in both the dark room and dark chamber. A dim red light was used in the dark room if necessary.

In order to remove any effect resulting from sunlight illumination, the subjects entered indoors at least one hour in advance of testing. According to our measurement, delayed luminescence due to sunlight continued for more than one hour if the subject was exposed directly during ordinary outdoor activity. Before entering the dark room, the subjects were directed to wash their hands with soap and tap water to remove any organic and inorganic material on their hands. All metal belongings including eye-glasses, watches and coins were removed from the subject. In the dark room, the subject sat on a chair for 10 minutes to have a rest. The reason was two-folded. One was the dark adaptation necessary for spontaneous photon emission measurement. The other was the mental and physical stabilization of a subject.

Before entering the dark chamber, a subject cleaned the palm and dorsal part of his/her hands with alcohol. A rest period of ten minutes was applied again for further dark adaptation inside the chamber. In the meanwhile, the dark count was recorded to check the performance of the PMT and to acquire data for background correction. A dark level of 13 - 15 cps was detected during the experiments and its fluctuation level was negligible compared with the rate of biophoton emission from the hands. After the rest, the subject put his/her palms on the tops of the each adaptors and the measurement started. As a period of 3 minutes for each measurement ended, the subject was asked to face his/her dorsum to the adaptors for a three minutes measurement. The dark levels of the PMTs were checked again after the biophoton measurements were finished. As this sequence of measurement was completed, the subject was guided to exit the chamber.

Figure 1. Schematics of a biophoton experiment setup. PMTs were connected to two separate counting boards.

3. Results and Analysis

Typical raw data obtained from common cold patients is illustrated in Fig 2. In the Figure, a dotted line indicates SPE from the left dorsum and a thick line does that from the right dorsum. The average biophoton had a fluctuation of about 14 cps. However, the quantity of the biophoton from the left and right dorsa was different, which is often seen in unhealthy subjects. In order to investigate the daily change in the biophotons of the subjects, we executed measurements from several cold patients on a daily basis. The results are shown in Fig 3. Daily records of biophoton emission showed a correspondence to the symptoms that patients declared. For example, the subject in Fig 3-(a) noted that he was felt normal
on the day 3. However his symptoms became more serious by the next day. Biophotonic behavior on those days followed his symptoms faithfully. On the last day, he finally recovered from his cold and his biophoton levels demonstrated this accordingly. A similar behavior was observed in a different subject as shown in Fig 3-(b). The relative convergence of all four data indicates recovery from a cold.

![Biophoton Intensity Graph](image)

Figure 2. Typical biophoton data from a cold patient. The average biophoton emission rate was constant. However, due to the fluctuation, at least 3 min. was necessary for each measurement. The subject showed an imbalance in biophoton emission from the left and right hands.

Most of diseases and physiological disorders are a reflection of the imbalance in Yin and Yang of a subject to some extent. Hence, it is traditionally important for medical applications to measure the imbalance. However, there has been lack of methods to measure those quantities. Our method of biophoton measurement could be applied to detect this imbalance objectively and precisely. The hands and feet are important to TCM because all the meridian channels pass through them. And there are many response points as well as meridian points on them. These make the palms and feet suitable areas for biophoton measurements, but due to technical limitation we studied only palms.

Modern pathology tells us that the common cold is generated by a viral infection of the upper respiratory system. Depending on the location of the infection, the virus and the condition of the subject, patients experience various symptoms. Most of the colds can be cured within two weeks unless there are complications. On the other hand, TCM considers that the common cold is caused by two types of Winds, Wind cold and Wind hot and their symptoms vary accordingly. Wind cold generates chills and Wind hot does fever. In this case, Wind is a pathogenic factor. When a subject is attacked by Winds his Yin/Yang balance may be broken. In our results, subjects showed different biophoton trends when they caught a cold. We conjecture that different Winds and imbalances are mainly responsible for the various symptoms of subjects. According to TCM, a cold tends to affect the upper portions and outer surface of the body in the beginning stage. As the cold gets serious, it goes into deeper. Accordingly the imbalance of biophoton emission was prominent at the dorsum, in the beginning stage of a cold, and then the imbalance increased at the palm as the cold proceeded.

![Biophoton Intensity Graph](image)

Figures 3-(a) and 3-(b): Two Figures show the daily change in the biophoton emission reflecting the symptoms of the cold patients. Lp, Rp, Ld and Rd denote left palm, right palm, left dorsum and right dorsum, respectively. All four data on the same day are scattered and the data vary each day. However, all the data converge on the last day, meaning that biophotonic balance has been restored and the patient has recovered from the cold.

Since a cold is one of the most common disorders and there is no medicine for the disease, prevention or early detection to cure is the most favorable. Our results show that the detection of broken balance might be one way of determining the cold vulnerability of a human being. And
careful analysis of the imbalance might lead to identification of the progress of the cold. Based on this judgment, doctors could prescribes a remedy for curing the cold. If the possibility of getting a cold could be reduced, its social benefit as well as its benefit to individual would be considerable. Therefore, the biophotonic approach to this matter needs to be pursued further and could be expanded to other diseases which are caused by the imbalance of Yin/Yang.

4. Conclusion

Biophotonic measurements of cold patients indicated that the left-right imbalance of biophoton emission rates changes as the cold state proceeds. In other words, the imbalance of the biophoton emission rate reflects the state of a cold patient accurately. As previously mentioned in the introduction, cold can be occurred when a subject’s Yin and Yang is not balanced. Therefore, it might be concluded that the method of biophoton measurement we have employed directly measure the quantity or balance of Yin and Yang in a human being. Our method can be used for evaluation and tracing the progress of cold patients.

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