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EXTENDED EXPOSURE TO A TLS CUBE

Peak Bioelectrical Response of 283% Measured Using EIS

Introduction

This study evaluates the longer-term bioelectrical effects of exposure to a single TLS Cube using Electrochemical Impedance Spectroscopy (EIS). EIS is a well-established scientific method used to measure electrical properties such as impedance and conductivity at the cellular and molecular levels (Yang, 2011; Hossain, 2021). Previous studies demonstrated that a single TLS Cube produced measurable increases in cellular impedance after one hour of exposure. The objective of the present study was to determine how these bioelectrical effects change as exposure duration increases. Using EIS measurements of living human buccal (inner cheek) cells, bioelectrical activity was evaluated over a fifteen-hour period of continuous exposure to a single TLS Cube. The results provide quantitative data regarding the magnitude and progression of the bioelectrical response over time.

Scientific Basis

Electrochemical Impedance Spectroscopy (EIS) measures how electrical energy moves through, interacts with, and is stored within biological systems. These measurements provide information about the electrical characteristics of cell membranes and the body's overall bioelectrical state (Hossain, 2021). Impedance consists of both real and imaginary components. The real component reflects resistance to electrical current flow, while the imaginary component reflects the storage and accumulation of electrical charge. Together, these measurements provide a comprehensive assessment of the bioelectrical properties of living cells. Previous studies have associated higher impedance values with improved cellular integrity, fluid balance, tissue health, and cellular function (Yamada et al., 2022; Catapano et al., 2023; Kim et al., 2025). Because biological processes depend on electrical activity, measurable changes in impedance may indicate changes in the body's bioelectrical environment.

What This Study Demonstrates

This study was designed to evaluate how the bioelectrical effects of a single TLS Cube change as exposure duration increases. Using Electrochemical Impedance Spectroscopy, measurements were obtained over a fifteen-hour period while a subject remained in the presence of a single TLS Cube. The results demonstrate that the bioelectrical response continued to increase with extended exposure, reaching a maximum increase of 283% after approximately eight hours. These findings show that the measurable effects observed after one hour represent only the beginning of the overall response, with substantially larger changes occurring during prolonged exposure. The study provides quantitative evidence that exposure duration is an important factor influencing the magnitude of the bioelectrical effects generated by a single TLS Cube.

Methods

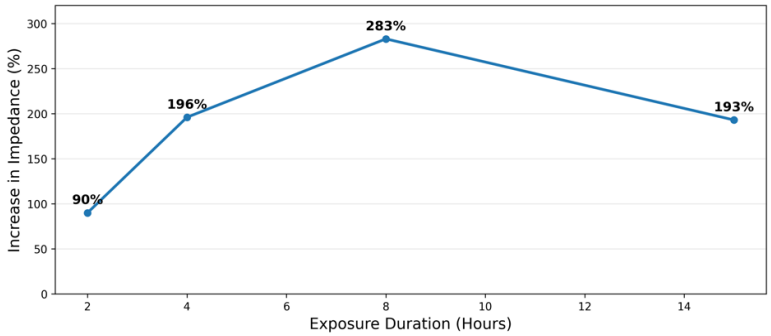
The long-term bioelectrical effects of a single TLS Cube were evaluated using Electrochemical Impedance Spectroscopy (EIS). Measurements were performed on living human buccal (inner cheek) cells collected before and at multiple time intervals during a fifteen-hour exposure period. The TLS Cube remained in the subject's bedroom for approximately five hours before the experiment began. The subject then remained within three to four feet of the Cube for eight hours during the day and an additional seven hours while sleeping. The subject was a healthy 70-year-old male. Impedance measurements were obtained before exposure and at multiple time points throughout the experiment. Percent change values were calculated relative to baseline measurements. Each sample was measured in triplicate, and all results are reported as percent change from baseline.

Results and Discussion

Figure 1 illustrates the progressive bioelectrical response observed during continuous exposure to a single TLS Cube. Cellular impedance increased by 90% after two hours, 196% after four hours, and reached a maximum increase of 283% after eight hours. These findings demonstrate that the bioelectrical effects of the TLS Cube continue to develop over time, with substantially greater responses observed during extended exposure periods.

Progressive Bioelectrical Response During Continuous Exposure to a Single TLS Cube

Figure 1



After fifteen hours of continuous exposure, impedance remained elevated at 193%. Although lower than the peak response observed at eight hours, the measurement remained substantially above baseline, indicating that the bioelectrical effect persisted even after the maximum response had been reached. These findings suggest that the TLS Cube produces both a strong peak response and a sustained elevation in bioelectrical activity during extended exposure. Taken together, the results demonstrate that exposure duration is an important factor influencing the magnitude of the bioelectrical response generated by a single TLS Cube. The maximum response occurred after approximately eight hours of continuous exposure, while the continued elevation observed after fifteen hours indicates that the bioelectrical effects remain significant well beyond the initial treatment period.

Conclusion

The results of this study demonstrate that the bioelectrical effects generated by a single TLS Cube increase substantially with prolonged exposure. Cellular impedance increased by 90% after two hours, 196% after four hours, and reached a maximum increase of 283% after eight hours of continuous exposure. These findings indicate that the measurable bioelectrical response continues to develop over time and that significantly larger effects are observed during extended exposure periods than during the initial stages of treatment. After fifteen hours of continuous exposure, impedance remained elevated at 193%, demonstrating that the bioelectrical response persisted well beyond the peak effect. The large increases in impedance observed throughout the study suggest measurable changes in cellular electrical properties, including both the movement and storage of electrical charge at the cellular membrane. Taken together, these findings provide quantitative evidence that extended exposure to a single TLS Cube produces a strong and sustained enhancement of cellular bioelectrical activity, with peak effects occurring after approximately eight hours and significant effects remaining present during longer exposure periods.

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