The Effects of the I-Tera Care Device on the Physical Properties of Different Water Samples

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ABSTRACT

Water is one of the most unique and essential substances on Earth. Consumer wellness products that claim to improve water quality through terahertz (THz) technology have surpassed independent scientific verification. This study critically examines the effects of the I-Tera Care device on the physicochemical properties of water and evaluates the scientific plausibility of terahertz–water interaction claims through an integrated experimental and evidence-based approach. A mixed-method design was employed, combining laboratory measurements with a systematic literature review conducted in accordance with PRISMA 2020 guidelines.

Four water types with different ionic compositions, bottled water, mineral water, tap water, and rainwater, were exposed to the I-Tera Care device under controlled conditions. Electrical conductivity (EC), total dissolved solids (TDS), pH, and temperature were all assessed both before and after exposure. The findings revealed measurable but non-uniform differences in EC, TDS, and pH across water types. Bottled, mineral, and tap water all had higher EC and TDS levels, however rainwater had lower levels, as well as a significant increase in pH. Notably, temperature increased consistently across all samples, showing that thermal effects are a substantial confounding factor in interpreting the reported physicochemical changes.

Synthesis of the reviewed literature demonstrates that while THz radiation can transiently modulate hydrogen-bond dynamics and ionic mobility in aqueous systems, such effects are reversible and do not constitute permanent structural modification of water. Taken together, the findings indicate that exposure to the I-Tera Care device induces short-term physicochemical variations that are strongly mediated by water composition and temperature. The results do not provide empirical support for claims of sustained water restructuring or therapeutic benefit. This study underscores the necessity for rigorous thermal control, advanced spectroscopic validation, and biologically relevant outcome measures in future evaluations of THz-based wellness technologies.

Keywords: I-Tera Care, terahertz device, water structure, electrical conductivity, pH, temperature, hydrogen bonding, mineral water, water quality.

INTRODUCTION

Water is a fundamental element for life and plays a critical role in biological, chemical, and physiological processes. The physicochemical characteristics of water such as pH, electrical conductivity (EC), and total dissolved solids (TDS), determine its quality and suitability for consumption and biological function. These properties are influenced by mineral composition, temperature, and external physical forces, including electromagnetic radiation. Recently, technological devices like I-Tera Care have been introduced, claiming to improve water quality by emitting terahertz (THz) frequencies that restructure or 'energize' water molecules. These claims, however, remain scientifically controversial. Thus, this study aims to examine the measurable impact of the I-Tera Care device on several types of water samples through changes in EC, PPM, and pH values.

Terahertz (THz) radiation, located between microwave and infrared frequencies (0.1–10 THz), has attracted increasing scientific interest due to its strong interaction with polar molecules, especially water. Laboratory based studies have demonstrated that THz radiation can transiently affect hydrogen-bond networks and molecular mobility within water (Heyden & Havenith, 2010; Markelz, 2008). These interactions form the scientific foundation for emerging applications of THz technology in spectroscopy, imaging, and biomedical research.

In recent years, consumer wellness devices such as I-TeraCare have entered the market, claiming to emit THz and far-infrared radiation capable of "structuring," "energizing," or improving the quality of drinking water. Such claims have gained popularity among consumers; however, they remain controversial due to the lack of independent scientific validation. Most available information originates from promotional materials rather than peer-reviewed research.

Therefore, there is a need for systematic academic investigation to experimentally evaluate whether I-TeraCare exposure produces measurable changes in water properties and critically examine existing scientific literature related to THz–water and THz–biological interactions.

Problem Statement

Despite widespread commercial claims regarding the health and hydration benefits of I-TeraCare-treated water, there is a notable absence of peer-reviewed empirical evidence supporting these assertions. Existing THz research is largely confined to controlled laboratory conditions using specialized equipment, while consumer devices such as I-TeraCare operate without publicly available technical specifications or clinical validation. This discrepancy creates uncertainty among consumers, researchers, and policymakers.

Research Objectives

1. To determine the effects of I-TeraCare exposure on the electrical conductivity, total dissolved solids, and pH of different water samples.
2. To systematically review peer-reviewed and grey literature on terahertz radiation interactions with water and biological systems.
3. To evaluate whether current scientific evidence supports the health-related claims associated with I-TeraCare-treated water.

Research Questions

1. Does exposure to the I-TeraCare device cause measurable changes in EC, TDS, and pH of water?
2. What is the current state of scientific evidence regarding THz–water interactions?
3. Are the wellness and health claims of I-TeraCare supported by peer-reviewed research?

Significance of the Study

This study contributes to the scientific discourse by providing an evidence-based evaluation of a widely marketed wellness technology. The findings are expected to benefit researchers, consumers, educators, and regulatory authorities by clarifying the scientific plausibility and limitations of THz-based water treatment claims.

LITERATURE REVIEW

Water Structure and Physicochemical Properties

Water quality is commonly characterised using physicochemical parameters such as electrical conductivity (EC), total dissolved solids (TDS), pH, and temperature. These parameters are widely used indicators in environmental science, water treatment, and laboratory-based water analysis (APHA, 2017).

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Electrical conductivity reflects the ability of water to conduct electric current and is directly related to the concentration and mobility of dissolved ions (Sawyer et al., 2013). Total dissolved solids represent the combined content of inorganic salts and small amounts of organic matter present in water, often correlating with EC but not always proportionally due to differences in ionic valence and mobility (WHO, 2017). Similarly, TDS represents the total concentration of dissolved inorganic and organic substances, and its measurement is closely related to EC values (Hem, 1985).

The pH of water indicates its acid base balance and is influenced by hydrogen ion activity rather than solely by chemical composition. Municipal tap water often exhibits stable pH values due to buffering agents introduced during water treatment processes (WHO, 2017). Temperature plays a critical role in water chemistry, as it affects viscosity, ion mobility, and equilibrium reactions, thereby influencing EC, TDS, and pH measurements (Stumm & Morgan, 1996).

Previous studies have shown that external physical factors such as temperature, electromagnetic fields, and radiation exposure can induce short-term changes in these parameters by altering ion mobility and molecular interactions (Ribeiro et al., 2019). However, changes in physicochemical measurements do not necessarily indicate permanent structural modification of water.

Molecular Structure of Water and Hydrogen Bonding

At the molecular level, water exhibits a dynamic structure governed by hydrogen bonding between individual molecules. These hydrogen bonds form transient networks that continuously break and reform on picosecond timescales (Chaplin, 2006). Rather than existing as a static structure, liquid water comprises fluctuating clusters whose configurations are highly sensitive to external physical stimuli.

Ball (2008) emphasized that the biological and chemical significance of water arises from its dynamic hydrogen-bond network rather than any fixed molecular arrangement. External influences such as temperature changes or electromagnetic fields can temporarily alter these interactions, leading to short-lived variations in molecular organization without permanent restructuring.

Understanding this dynamic nature is essential when interpreting experimental observations related to changes in physicochemical properties, as such changes often reflect transient molecular behavior rather than long-term chemical modification

Terahertz Radiation and Water Interaction

Terahertz (THz) radiation occupies the electromagnetic spectrum between microwaves and infrared light (0.1–10 THz) and corresponds to collective vibrational and rotational modes of hydrogen-bonded water molecules (Ferguson & Zhang, 2002). Due to strong absorption by water, THz radiation has been extensively applied in spectroscopy to probe water dynamics and molecular interactions.

Experimental and computational studies have demonstrated that THz radiation can transiently influence hydrogen-bond dynamics and ionic mobility in aqueous systems. Heyden and Havenith (2010) combined THz spectroscopy with molecular dynamics simulations and reported temporary increases in molecular rotational freedom, which may facilitate ion movement without altering chemical composition.

Similarly, Nagai et al. (2019) used terahertz time-domain spectroscopy (THz-TDS) to observe short-lived changes in water dynamics, confirming that such effects dissipate once the external stimulus is removed. Xu et al. (2020) further supported these findings, concluding that THz radiation probes water dynamics rather than inducing permanent structural changes.

Collectively, these studies indicate that while THz exposure can modulate water behaviour at the molecular level, the effects are transient and reversible.

Biological Effects of Terahertz Exposure

Beyond water structure, THz radiation has been investigated for its biological effects at cellular and tissue levels. Low-intensity THz exposure (<1 mW/cm^2) has generally been reported as non-cytotoxic, with studies demonstrating no significant DNA damage or loss of cell viability (Korenstein et al., 2019). Some researchers have observed subtle, transient changes in membrane permeability and protein conformation, attributed to enhanced molecular vibration rather than biochemical alteration (Hori et al., 2021).

At higher intensities or prolonged exposure durations, THz radiation may induce localised dielectric heating and reversible conformational changes in biomolecules (Pickwell & Wallace, 2006). However, these effects do not equate to therapeutic benefit and remain primarily of interest for imaging and diagnostic applications rather than wellness interventions.

Crucially, no controlled human clinical trials have demonstrated health improvements resulting from THz exposure or consumption of THz-treated water.

Influence of Temperature as a Confounding Variable

Temperature is a critical confounding factor in studies examining water properties. An increase in temperature reduces water viscosity and enhances ionic mobility, leading to higher EC readings and potential shifts in pH (Stumm & Morgan, 1996). Kell (1975) demonstrated that even small temperature variations significantly affect the physical properties of liquid water.

In experimental settings, distinguishing between thermal effects and non-thermal electromagnetic effects is essential. Markelz (2008) highlighted that many observed changes attributed to electromagnetic exposure may be partially or wholly explained by concurrent temperature increases. Consequently, rigorous temperature control is necessary to ensure the validity of conclusions regarding THz–water interactions.

Consumer Terahertz Devices and I-TeraCare

I-TeraCare is marketed as a handheld wellness device that emits terahertz and far-infrared radiation, purportedly enhancing water quality and promoting health benefits. A review of available literature reveals that information on I-TeraCare is largely confined to grey literature, including patents, distributor materials, and promotional documents.

While patents describe theoretical mechanisms of THz emission, they rarely provide quantified emission spectra, power density, or validated biological outcomes (World Intellectual Property Organization, 2022). Promotional claims frequently extrapolate laboratory-based THz findings to consumer-level effects without empirical justification. Similar patterns have been observed in other wellness technologies, where scientific terminology is used in marketing despite limited evidence (Ernst, 2018).

Consequently, there remains a substantial gap between established scientific knowledge of THz–water interactions and the claims associated with commercial devices such as I-TeraCare. This gap underscores the necessity of independent experimental evaluation and systematic evidence synthesis, as undertaken in the present study.

METHODOLOGY

Research Design

This study adopted a mixed-method research design integrating an experimental laboratory-based approach with a systematic literature review. The experimental component employed a pre–post measurement design to examine changes in selected physicochemical parameters of water following exposure to the I-TeraCare device. The systematic review component followed the PRISMA 2020 guidelines to ensure transparency, reproducibility, and methodological rigour.

The combination of experimental measurement and systematic evidence synthesis enhances the internal validity of the study by triangulating empirical observations with established scientific literature.

Experimental Procedure

Water Samples

Four water types were selected to represent different mineral and ionic compositions:

1. Spritzer bottled water
2. Evian mineral water
3. Tap water
4. Rain water

The selection of diverse water sources was intended to improve external validity by ensuring that findings are not limited to a single water type.

Instruments and Equipment

Electrical conductivity (EC) and total dissolved solids (TDS) were measured using a calibrated digital conductivity/TDS meter, while pH was measured using a digital pH meter. All instruments were calibrated prior to data collection according to manufacturer guidelines using standard buffer solutions (pH 4.00, 7.00, and 10.00) and conductivity standards.

Calibration procedures were conducted before each measurement session to minimise systematic measurement error and enhance measurement reliability.

I-TeraCare Exposure Protocol

Each water sample was exposed to the I-TeraCare device under standardised conditions, including:

- Fixed exposure duration
- Consistent distance between the device and water container
- Controlled ambient temperature

These controls were implemented to reduce confounding variables and improve internal validity. Immediately after exposure, post-treatment measurements were recorded to minimise environmental influence.

Systematic Review Procedure

The systematic review followed PRISMA 2020 standards. Electronic databases searched included PubMed, Scopus, ScienceDirect, SpringerLink, and MDPI Journals. Grey literature sources, such as patents and manufacturer documents, were also reviewed to contextualise commercial claims.

Inclusion and exclusion criteria were defined a priori to reduce selection bias. Two-stage screening (title/abstract followed by full-text review) was applied to ensure consistency and transparency.

Data Analysis

Experimental data were analysed descriptively by comparing pre- and post-exposure values of EC, TDS, and pH. Given the exploratory nature of the study and the limited sample size, inferential statistical analysis was not conducted. Instead, emphasis was placed on identifying observable trends and consistency across water types.

For the systematic review, narrative synthesis was employed due to heterogeneity in study designs, exposure parameters, and outcome measures.

Validity of the Study

Internal Validity

Internal validity was strengthened through the use of controlled experimental conditions, including standardised exposure duration, calibrated instruments, and immediate post-exposure measurements. Baseline (pre-exposure) measurements served as within-sample controls, reducing inter-sample variability.

External Validity

External validity was addressed by analysing multiple water types with varying mineral compositions. This increases the generalisability of the findings to different real-world water sources. However, generalisation to biological or clinical outcomes is limited, as the study focused exclusively on physicochemical properties of water.

Construct Validity

Construct validity was ensured by selecting widely accepted and standardised physicochemical indicators (EC, TDS, and pH) to represent changes in water properties. These parameters are commonly used in water quality and environmental science research.

Reliability of the Study

Instrument Reliability

Reliability of measurements was enhanced through instrument calibration and the use of digital meters with established accuracy specifications. Consistent measurement procedures were applied across all samples.

Procedural Reliability

All experimental steps followed a standard operating procedure (SOP), including sample handling, exposure protocol, and measurement timing. This procedural consistency supports repeatability and replicability of the study.

Data Recording and Consistency

Measurements were recorded immediately and systematically using the same units and conditions. Where minor fluctuations occurred, readings were stabilised before recording to ensure consistency.

Ethical Considerations

This study did not involve human or animal subjects and therefore did not require formal ethical clearance. Nevertheless, ethical research principles were observed, including accurate data reporting, avoidance of misleading claims, and transparency in methodology.

Methodological Limitations

Despite efforts to enhance validity and reliability, several limitations are acknowledged:

- Absence of repeated exposure trials and long-term monitoring
- Lack of spectroscopic analysis to directly observe molecular changes
- Limited statistical power due to small sample size

These limitations are addressed further in Chapter 5 (Discussion) and inform recommendations for future research.

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RESULTS

Descriptive Results of Physicochemical Parameters

The data reveal consistent patterns across most samples, indicating that I-Tera Care exposure can alter measurable water properties. Results are organised into formal tables to facilitate clarity, comparability, and academic presentation. Parameters analysed include electrical conductivity (EC), total dissolved solids (TDS/PPM), temperature, and pH.

Changes in Physicochemical Properties Before and After I-TeraCare Exposure

Table 1 Summarizes the measured parameters for Spritzer bottled water before and after exposure.

Parameter	Before	After	Change
EC (µS/cm)	148	206	+58
Temperature (°C)	27.0	31.8	+4.8
TDS / PPM	73	101	+28
pH	6.86	7.59	+0.73

The results indicate increased EC, TDS, temperature, and pH following exposure, suggesting enhanced ionic mobility and a shift towards alkalinity.

Table 2 Presents result for Evian mineral water.

Parameter	Before	After	Change
EC (µS/cm)	352	426	+74
Temperature (°C)	26.0	30.0	+4.0
TDS / PPM	178	209	+31
pH	7.20	8.00	+0.80

A consistent increase in EC, TDS, and pH was observed, indicating that mineral-rich water may be more responsive to exposure effects.

Table 3 Summarises the results for rain water.

Parameter	Before	After	Change
EC (µS/cm)	440	388	−52
Temperature (°C)	24.7	27.4	+2.7
TDS / PPM	223	187	−36
pH	7.90	8.75	+0.85

In contrast to bottled and mineral water, EC and TDS decreased while pH increased substantially, suggesting possible ion neutralisation or redistribution effects.

Table 4 presents the findings for tap water.

Parameter	Before	After	Change
EC (µS/cm)	136	188	+52
Temperature (°C)	28.9	30.1	+1.2
TDS / PPM	69	94	+25
pH	6.86	6.86	0.00

Tap water showed increased EC and TDS but no observable change in pH, indicating buffering effects likely due to treatment chemicals.

Comparative Summary Across Water Types

Table 5 provides a comparative overview of changes in key parameters across all water samples.

Water Type	ΔEC (µS/cm)	ΔTDS (PPM)	ΔpH	ΔTemp (°C)
Spritzer	+58	+28	+0.73	+4.8
Evian	+74	+31	+0.80	+4.0
Rain	−52	−36	+0.85	+2.7
Tap	+52	+25	0.00	+1.2

Key Findings

1. I-TeraCare exposure resulted in measurable changes in EC and TDS for most water types.
2. pH increased across all samples except tap water, which exhibited buffering stability.
3. Temperature increased consistently, suggesting a thermal contribution to observed changes.
4. The magnitude and direction of changes varied depending on water composition.

For Spritzer, Evian, and Tap water, both EC and PPM increased, accompanied by a rise in pH. This suggests enhanced ionic mobility and a shift towards alkalinity. Such effects could be due to molecular vibration or the possible restructuring of hydrogen bonds within the water when exposed to terahertz frequencies.

For swimming pool water, the EC and PPM decreased, yet pH increased substantially. This suggests that certain ions may have been neutralized or complexed, leading to lower conductivity but greater alkalinity.

The consistent increase in pH across all samples implies that I-Tera Care exposure may influence the hydrogen ion concentration in water, making it more alkaline. Alkaline water is often associated with potential health benefits; however, these claims require careful biochemical validation.

Suggestions Based on Findings

Based on the experimental results, the following suggestions are proposed:

1. **Controlled Temperature Studies**: Future studies should isolate thermal effects by maintaining constant water temperature during exposure.
2. **Repeated Trials**: Multiple exposure cycles and repeated measurements are recommended to improve reliability and statistical strength.
3. **Spectroscopic Analysis**: Advanced techniques such as THz-TDS or infrared spectroscopy should be employed to directly observe molecular interactions.
4. **Biological Relevance Testing**: Subsequent research should evaluate whether observed physicochemical changes translate into biological or health-related outcomes.
5. **Cautious Interpretation**: Observed changes in water parameters should not be interpreted as evidence of health benefits without clinical validation.

DISCUSSION

Overview of Findings

This chapter interprets the experimental results presented in Chapter 4 by linking the observed changes in physicochemical parameters (Tables 4.1–4.5) to established theoretical concepts of water chemistry and terahertz (THz) radiation water interaction. The discussion focuses on explaining *why* such changes may have occurred, rather than merely restating the results.

Overall, the findings demonstrate that exposure to the I-TeraCare device resulted in measurable changes in electrical conductivity (EC), total dissolved solids (TDS), temperature, and pH across most water types. However, the magnitude and direction of these changes varied depending on the initial composition of the water, indicating that water chemistry plays a critical moderating role.

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Electrical Conductivity and Total Dissolved Solids

As shown in Tables 4.1, 4.2, and 4.4, bottled water (Spritzer), mineral water (Evian), and tap water exhibited increases in EC and TDS following I-TeraCare exposure. From a theoretical perspective, EC is influenced not only by the concentration of ions but also by their mobility within the water matrix (Sawyer et al., 2013). The observed increases may therefore reflect enhanced ionic mobility rather than the introduction of new dissolved substances.

THz radiation is known to interact with hydrogen-bond networks, temporarily increasing molecular rotational freedom (Heyden & Havenith, 2010). This transient disruption can reduce resistance to ion movement, leading to higher EC readings. The concurrent increase in TDS values may be attributed to improved detectability of dissolved ions rather than a true increase in solute concentration.

In contrast, rain water demonstrated a decrease in EC and TDS (Table 4.3). This finding suggests that in water with high initial ionic content, exposure may promote ion pairing, neutralisation, or redistribution, thereby reducing overall conductivity. Such behaviour is consistent with dielectric relaxation theory, which predicts different responses depending on ionic strength and composition.

pH Changes and Acid–Base Balance

A consistent increase in pH was observed across all water types except tap water (Tables 4.1–4.4). The rise in pH indicates a shift towards alkalinity, which may be explained by changes in hydrogen ion activity rather than chemical alteration of the water.

From a theoretical standpoint, THz radiation can influence the dynamics of hydrogen bonds and proton transfer pathways within water clusters. Temporary reorganisation of these pathways may reduce free hydrogen ion activity, resulting in a higher measured pH. Importantly, this does not imply permanent alkalisation or chemical modification of the water.

Tap water showed no change in pH despite increases in EC and TDS (Table 4.4). This stability is likely due to buffering agents commonly added during municipal water treatment, which resist changes in acid–base balance. This finding reinforces the interpretation that water composition strongly mediates the observed effects.

Role of Temperature Increase

All water samples experienced an increase in temperature following exposure (Table 4.5). Temperature is a critical confounding variable in water chemistry, as higher temperatures reduce viscosity and increase ionic mobility, thereby elevating EC and potentially influencing pH readings.

Although THz–water interactions can occur independently of heating, the consistent temperature rise observed in this study suggests that thermal effects contributed to the measured changes. Therefore, the results should be interpreted as a combined outcome of thermal influence and possible non-thermal electromagnetic interaction.

This finding aligns with previous literature emphasising the importance of controlling for temperature when studying electromagnetic effects on water (Markelz, 2008).

Comparison with Existing Literature

The experimental trends observed in this study are broadly consistent with laboratory-based THz spectroscopy research, which reports transient modulation of hydrogen-bond dynamics without permanent restructuring of water (Nagai et al., 2019; Xu et al., 2020). Crucially, no peer-reviewed studies have demonstrated that such transient changes persist after exposure or translate into enhanced biological function.

Therefore, while the observed increases in EC and pH may appear to support certain commercial claims at a superficial level, the underlying scientific evidence indicates that these changes are temporary and physicochemical in nature.

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Implications for I-TeraCare Health Claims

The findings of this study do not provide evidence to support claims that I-TeraCare-treated water confers health or therapeutic benefits. Changes in EC, TDS, or pH alone are insufficient indicators of improved hydration, detoxification, or cellular function.

From a scientific standpoint, the results reinforce the distinction between measurable physical changes and clinically meaningful outcomes. Without controlled biological or clinical studies, extrapolation of these findings to health benefits remains unjustified.

Summary of Discussion

In summary, the experimental results demonstrate that I-TeraCare exposure can transiently influence physicochemical properties of water, with effects strongly moderated by water composition and temperature. These findings are consistent with established theories of THz–water interaction but do not substantiate claims of permanent water restructuring or health enhancement.

The discussion highlights the importance of cautious interpretation, rigorous experimental control, and clear separation between physical measurement and biological relevance.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study investigated the effects of I-TeraCare exposure on selected physicochemical properties of water and evaluated the scientific evidence underlying terahertz (THz) based wellness claims. The experimental findings demonstrated that exposure to the I-TeraCare device resulted in measurable but inconsistent changes in electrical conductivity (EC), total dissolved solids (TDS), temperature, and pH across different water types.

When interpreted alongside the systematic literature review, these findings support the conclusion that THz radiation can transiently influence water behaviour at the molecular and ionic levels, primarily through modulation of hydrogen-bond dynamics and ionic mobility. However, the observed effects were short-term, strongly influenced by water composition and temperature, and did not provide evidence of permanent water restructuring or enhanced biological functionality.

Importantly, the study found no scientific basis to support health or therapeutic claims associated with consuming I-TeraCare-treated water. The results reinforce the distinction between measurable physicochemical variation and clinically meaningful outcomes.

Recommendations

Decoupling Electromagnetic and Thermal Effects

In terahertz (THz) exposure investigations, separating electromagnetic effects from concurrent thermal artifacts is a major methodological problem. The lack of rigorous thermal regulation restricts the ability to definitively attribute physicochemical changes to non-thermal THz interactions. Therefore, strict temperature control via thermostatically regulated water baths, thermal shielding, or feedback-controlled cooling systems should be the main focus of future research. Experimental designs should incorporate continuous, high-resolution temperature monitoring to allow for accurate distinction between heat-driven and electromagnetic-induced reactions. The advancement of mechanistic clarity and the resolution of long-standing disputes regarding non-thermal THz bioeffects depend on such methodological improvement.

Strengthening Reliability and Reproducibility

In spite of the use of single-exposure measurements, which are insufficient to measure short-term fluctuations or experimental noise, reliability is still a major challenge. Repeated-measures designs with several exposure cycles and temporal sample points should be used in future studies. This method would decrease random error, increase reproducibility, and enable the use of reliable inferential statistics. In line with current demands for methodological transparency and reproducibility in physical and bioelectromagnetic research, replication across separate experimental sessions and labs would further increase confidence in observed outcomes.

Advancing Construct Validity Through Direct Molecular Probing

Electrical conductivity, total dissolved solids, and pH are examples of bulk physicochemical indicators that provide only indirect evidence of possible molecular reorganization in water. Future research should incorporate direct molecular-level methods such as nuclear magnetic resonance (NMR), terahertz time-domain spectroscopy (THz-TDS), and infrared spectroscopy to support assertions of structural or dynamical alterations. By enabling direct observation of collective molecular movements, hydrogen-bond dynamics, and dipole relaxation, these modalities will improve construct validity and permit more conclusive mechanistic interpretations of THz–water interactions.

Extending from Physical Observations to Biological Relevance

Although changes in the physicochemical characteristics of water may indicate underlying structural modification, their biological or physiological significance is still unknown. Therefore, a translational paradigm should be used in future research, moving from controlled physicochemical evaluations to models that are relevant to biology. This could involve carefully planned human hydration trials carried out under clinical supervision and ethical permission, in vitro tests, or cell-based hydration investigations. Such a method would make it clear if physical alterations seen in experiments have significant biological impacts or are limited to isolated physical systems.

Safeguarding Scientific and Ethical Standards in Health-Related Interpretations

The need to exercise caution when extending laboratory results to health-related claims is highlighted by the increasing commercial interest in THz-based technologies. Claims about health advantages remain theoretical with the risk of damaging scientific credibility in the absence of thorough clinical validation. Transparent reporting guidelines, which include thorough disclosure of exposure parameters and device details, should be followed in future study. Furthermore, before any health-related claims can be properly advanced, oversight by regulators and peer-reviewed clinical evaluation are crucial criteria that guarantee consumer protection and uphold the integrity of the scientific discourse.

Final Remarks

In conclusion, this study provides an evidence-based evaluation of I-TeraCare exposure on water properties and situates the findings within established THz scientific theory. While transient physicochemical changes were observed, these effects do not substantiate claims of health enhancement or therapeutic benefit.

The recommendations offered serve as a roadmap for future research aimed at resolving current limitations, strengthening methodological rigour, and bridging the gap between theoretical plausibility and empirical validation. Until such evidence is available, interpretations of I-TeraCare effects should remain cautious and scientifically grounded.

This study demonstrates that the I-Tera Care device has measurable effects on the physicochemical properties of various water samples. The observed increases in pH and EC suggest that the device may influence the structural and electrical behavior of water molecules. Nevertheless, while these changes are observable, the underlying mechanisms remain speculative. Further research using controlled laboratory settings, larger sample sizes, and advanced analytical techniques (e.g., spectroscopy, molecular dynamics) is essential to determine whether these effects are due to actual terahertz interactions or simply thermal and environmental factors.

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