

Complementary and Alternative Medicine: Evaluation of the impact of Biofield Energy Treatment on L-Cysteine



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Abstract

L-cysteine is a semi-essential amino acid that is also used in alternative medicine to treat cardiovascular disease, inflammation, angina, chronic bronchitis, chronic obstructive pulmonary disease, diabetes, osteoarthritis, flu, etc. This study was aimed to analyze the changes in the L-cysteine regarding its physicochemical and thermal properties due to the impact of the Trivedi Effect® - Consciousness Energy Healing Treatment. The L-cysteine was divided into the control and treated parts among which, the control sample was not given any treatment; while the treated sample received the Trivedi Effect®-Biofield Energy Healing Treatment, remotely, by a well-known Biofield Energy Healer, Dahryn Trivedi. The results indicated a significant impact of the Biofield Energy Treatment on the particle size distribution of the treated sample as the particle sizes were significantly decreased by 10.18% (d_{10}), 12.97% (d_{50}), 16.83% (d_{90}), and 14.36% [D (4, 3)] compared with the control sample. Hence, the resultant surface area of the treated sample was increased by 14.29% compared with the control sample. The PXRD diffractograms of the treated sample showed alterations in the intensities and crystallite sizes ranging from -47.62% to 110.11% and -17.74% to -74.57%, respectively, along with 49.81% decrease in the average crystallite size, compared with the control L-cysteine sample. The latent heat of decompositions of the treated sample was significantly increased by 11.45% and 20.79%, respectively, compared with the control L-cysteine sample. The total weight loss was significantly reduced in the treated L-cysteine sample by 5.59%; however, the residue weight was remarkably increased by 1111.20%, compared with the control sample. Thus, the overall study indicated the importance of the Biofield Energy treatment in the alteration of the particle size, surface area, crystalline properties, and thermal properties of the L-cysteine sample compared with the control sample. Therefore, it could be considered that Biofield Energy Treated L-cysteine might show better solubility, bioavailability, and thermal stability compared with the control sample.

Keywords: L-cysteine, The Trivedi Effect®; Energy of Consciousness Healing Treatment; PSA; PXRD; DSC; TGA

Introduction

L-Cysteine is a semi-essential amino acid for the human body where it is available in the extracellular space in the form of L-cystine, mainly. It is classified as semi-essential as it could be biosynthesized by the body in some amount in the presence of normal conditions. The process of biosynthesis requires methionine, through which it gets the sulfur that is necessary for this process of making the amino acid. Therefore, it also makes the sulphur under the classification of an essential nutrient for the human body [1]. A transport system helps the transfer of extracellular L-cystine within the cells across the plasma membrane where it gets reduced in the form of L-cysteine by the help of thioredoxin and reduced glutathione. The role of intracellular L-cysteine is quite evident in the process of cellular

homeostasis. It also acts as a precursor for the synthesis of protein as well as the production of GSH, hydrogen sulfide, and taurine [2,3]. The use of L-cysteine is also evident in the alternative medicine as a natural treatment for cardiovascular disease, inflammation, angina, chronic bronchitis, diabetes, osteoarthritis, flu, and inflammatory bowel disease, etc. [4-7]. It is also used in improving the health of lungs in chronic obstructive pulmonary disease (COPD) patients, which is considered as the third most common cause of death in the United States [8].

The natural food resources that contain L-cysteine are dairy products, meat, eggs, legumes, oats, and vegetables such as, broccoli, garlic, Brussels sprouts, granola, onions, sprouted lentils, and peppers. Some studies also reported the use of L-cysteine in the

prevention of colon cancer, promoting the detox, and boosting sports performance. The main health benefits of L-cysteine are supposed to occur from its antioxidant properties that also support the ability of the body in managing the blood sugar, digestive health, and the skin's appearance [9-11]. L-cysteine is also used widely for breaking up the mucus caused by the pulmonary and respiratory conditions and it also helps in regulating the level of glutamate within the body that ultimately affects the neurons taking part in the central nervous system [12,13]. The L-cysteine deficiency might occur in the elderly and infant's population that are unable to biosynthesize it within the body. Besides, the people having metabolic syndrome and some malabsorption issues may also have the deficiency of L-cysteine. Its deficiency can cause a slow recovery from injury and other diseases due to the compromised immune system resulted from insufficient L-cysteine in the body [14,15]. Thus, it is provided by the healthcare professionals in the form of pharmaceutical/nutraceutical formulations to supplement the bodily need. The amino acids, such as L-cysteine, are highly affected by their physicochemical properties in terms of their biological performance. Therefore, various researchers were working in this field to enhance the performance of amino acids in the body by altering the physicochemical and thermal profile, such as the particle size, surface area, crystalline structure, and melting point, etc. [16,17].

In recent days, the Biofield Energy Treatment is also used by various researchers to enhance the performance of various compounds due to its significant impact on the living and non-living objects [18,19]. The Biofield Energy is a type of energy medicine that is used as the Complementary and Alternative Medicine (CAM) and includes the traditional as well as the contemporary models and approach to fight against various diseases [20-22]. The living organisms are known to have unique energy surrounding their body, which is known as the Biofield Energy that is an infinite and para-dimensional electromagnetic field. The Trivedi Effect® is a natural and methodically proven phenomenon in which an individual can harness this inherently intelligent energy and transfer it anywhere on the planet via the possible mediation of neutrinos [23]. The Consciousness Energy Healing Treatment has been reported for its remarkable effects in the field of biotechnology [24,25], agriculture science [26,27], human health and wellness [28-30], microbiology [31-33], livestock [34], and metals and ceramics [35,36]. The significant impact of the Trivedi Effect® is also established scientifically on the physicochemical and thermal properties of various pharmaceutical/nutraceutical and organic compounds [37-39]. Thus, this study was executed to determine the effect of the Consciousness Energy Healing Treatment on the physicochemical and thermal properties of L-cysteine by using the analytical techniques such as particle size analysis (PSA), powder X-ray diffraction (PXRD), differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA)/differential thermogravimetric analysis (DTG).

Materials and Methods

Chemicals and Reagents

L-cysteine was purchased from Alfa Aesar, USA. Other chemicals which used during the experiments were of analytical grade purchased in India.

Consciousness Energy Healing Treatment Strategies

In this study, the L-cysteine was used as the test compound that was divided into the control and Biofield Energy Treated parts. The control sample was not given any treatment; whereas, the treated part remotely received the Consciousness Energy Healing Treatment by the well-known Biofield Energy Healer, Dahryn Trivedi (USA). The treatment process involves keeping the sample under the standard laboratory conditions followed by providing the Trivedi Effect® - Consciousness Energy Healing Treatment by the Biofield Energy Healer for 3 minutes through the Unique Energy Transmission process. Besides, the control sample was subjected to a "sham" healer under similar laboratory conditions, who did not have any knowledge about the Biofield Energy Treatment. After the treatment, the control and the Biofield Energy Treated samples were kept in similar sealed conditions and further characterized by using modern analytical techniques.

Characterization

The physicochemical and thermal analysis of L-cysteine was performed. The PSA was performed using Malvern Mastersizer 2000, from the UK using the wet method [40,41]. The PXRD analysis of the L-cysteine powder sample was performed with the help of Rigaku MiniFlex-II Desktop X-ray diffractometer (Japan) [42,43]. The average size of crystallites was calculated from PXRD data using the Scherrer's formula (1):

$$G = k\lambda / \beta \cos\theta \quad (1)$$

Where G is the crystallite size in nm, k is the equipment constant, λ is the radiation wavelength, β is the full-width at half maximum, and θ is the Bragg angle [44].

Similarly, the DSC analysis of L-cysteine was performed with the help of DSC Q200, TA instruments. The TGA/DTG thermograms of L-cysteine were obtained with the help of TGA Q50 TA instruments [40,41]. The % change in specific surface area, particle size, crystallite size, peak intensity, melting point, latent heat, weight loss and the maximum thermal degradation temperature of the Biofield Energy Treated L-cysteine was calculated compared with the control sample using the following equation 2:

$$\%Change = \left[\frac{Treated - Control}{Control} \right] * 100 \quad (2)$$

Results and Discussion

Particle Size Analysis (PSA)

The particle size analysis helps in determining the impact of the Biofield Energy treatment on the particle size distribution

of the treated L-cysteine samples in comparison to the control sample. The results revealed that the particle size distribution corresponding to d_{10} , d_{50} , d_{90} , and D (4, 3) of the Biofield Energy Treated L-cysteine sample was significantly decreased by 10.18%, 12.97%, 16.83%, and 14.36%, respectively in comparison to the control sample (Table 1).

Table 1: Particle size distribution of the control and Biofield Treated L-cysteine.

| Parameter | d_{10} (μm) | d_{50} (μm) | d_{90} (μm) | D (4,3) (μm) | SSA (m^2/g) |
|-------------------------|----------------------------|----------------------------|----------------------------|---------------------------|-------------------------------|
| Control | 253.81 | 471.55 | 871.14 | 521.85 | 0.014 |
| Biofield Energy Treated | 227.97 | 410.41 | 724.57 | 446.92 | 0.016 |
| Percent change (%) | -10.18 | -12.97 | -16.83 | -14.36 | 14.29 |

d_{10} , d_{50} , and d_{90} : particle diameter corresponding to 10%, 50%, and 90% of the cumulative distribution, D (4,3): the average mass-volume diameter, and SSA: the specific surface area.

The study also showed a significant change in the specific surface area of the Biofield Energy Treated sample that might result due to the reduction in the particle sizes after the Biofield Energy Treatment. It was observed that the specific surface area of the Biofield Energy Treated sample was significantly increased by 14.29% compared to the control L-cysteine sample. The significant correlation between the surface area and the solubility pro-

Table 2: PXRD data for the control and Biofield Treated L-cysteine

| Entry No. | Bragg angle ($^{\circ}2\theta$) | | Intensity (cps) | | | Crystallite size (G, nm) | | |
|-----------|-----------------------------------|---------|-----------------|---------|----------|--------------------------|---------|----------|
| | Control | Treated | Control | Treated | % change | Control | Treated | % change |
| 1 | 13.24 | -- | 85 | -- | -- | 1183 | -- | -- |
| 2 | 18.32 | 18.33 | 282 | 182.0 | -35.46 | 751 | 524 | -30.23 |
| 3 | -- | 23.05 | -- | 292.0 | -- | -- | 763 | -- |
| 4 | 24.67 | 24.70 | 482 | 218.0 | -54.77 | 951 | 321 | -66.25 |
| 5 | 31.28 | 31.50 | 89 | 187.0 | 110.11 | 840 | 691 | -17.74 |
| 6 | 33.84 | -- | 383 | -- | -- | 493 | -- | -- |
| 7 | 38.53 | 38.68 | 42 | 22.0 | -47.62 | 1050 | 267 | -74.57 |
| 8 | 40.04 | -- | 298 | -- | -- | 805 | -- | -- |
| 9 | -- | 43.42 | -- | 33.3 | -- | -- | 550 | -- |
| 10 | -- | 49.81 | -- | 38.6 | -- | -- | 631 | -- |

The diffractograms corresponding to the powder XRD analysis of the control and Biofield Energy Treated samples were presented in Figure 1. Both the diffractograms showed the presence of sharp and intense peaks, which revealed the crystalline nature of the Biofield Energy Treated sample as that of the control sample. The data of both the diffractograms indicated the missing of some of the characteristic's peaks in the Biofield Energy Treated sample along with significant alterations in the Bragg's angle of the other peaks compared to the control sample. The diffractogram of the Biofield Energy Treated sample showed the highest peak intensity at 2θ equal to 23.05° ; while it was observed at 2θ equal to 24.67°

in the control sample. Besides, the peaks observed at 2θ equal to 13.24° , 33.84° , and 40.04° in the diffractogram of the control sample were not found in the Biofield Energy Treated sample. Instead, the Biofield Energy Treated sample's diffractogram showed new peaks at 2θ equal to 23.05° , 43.42° , and 49.81° , compared to the control sample. The significant changes were also found in the peak intensities and the crystallite sizes corresponding to the characteristic peaks of the Biofield Treated sample ranging from -47.62% to 110.11% and -17.74% to -74.57%, respectively, compared to the control sample. The significant changes observed in the positioning of the characteristic diffraction peaks as well as

Powder X-ray Diffraction (PXRD) Analysis

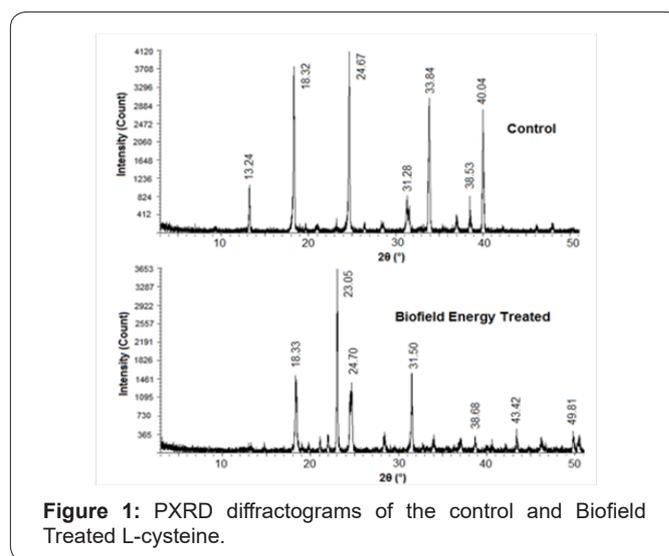


Figure 1: PXRD diffractograms of the control and Biofield Treated L-cysteine.

their corresponding intensities and crystallite sizes of the Biofield Energy Treated sample compared to the control sample indicated the possible alterations in their crystalline properties after the Biofield Energy Treatment (Table 2).

The treated sample also showed a significant change in the average crystallite size (450.75 nm) that was found to be decreased significantly by 49.81% in comparison to the control sample (898 nm). The crystalline properties of the compound could be altered after the Biofield Energy Treatment as studied previously by various researchers [23,35,36,38]. The basis of such alterations was established depending on the changes observed in the peak intensities of the characteristic peaks of the Biofield Energy Treated compounds and their corresponding crystallite sizes [48,49]. In this study, the results indicated the presence of some new peaks in the treated sample's diffractogram along with the absence of some characteristic peaks compared to the control sample that might indicate the formation of new polymorphs of L-cysteine after the Biofield Energy Treatment. There are various scientific studies which reported that the physical modifications in the crystalline structure of compounds such as, altering the crystal habits may alter the bioavailability and efficacy of the drug [50]. Thus, it is presumed that the Biofield Energy Treated sample might be more bioavailable and effective in comparison to the control L-cysteine sample.

Differential Scanning Calorimetry (DSC) Analysis

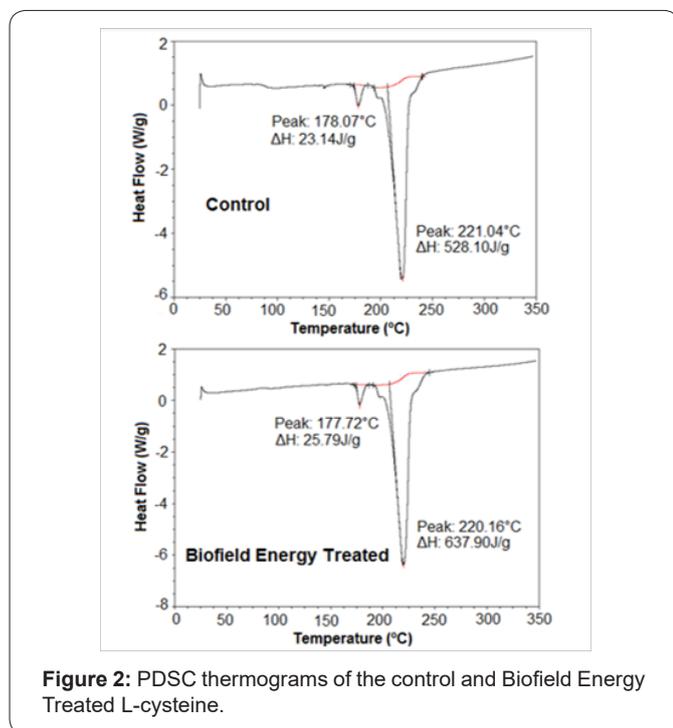


Figure 2: PDSC thermograms of the control and Biofield Energy Treated L-cysteine.

The DSC thermograms of the control and the Biofield Energy Treated samples (Figure 2) help in determining the difference in their melting temperature and latent heat [51] that may arise due to the Biofield Energy Treatment. The scientific studies previously done on L-cysteine reported the decomposition of the sample

during heating instead of its sublimation as the peaks observed in the DSC thermogram coincides with the drop in the TGA thermogram. Thus, the same temperature indicated the decomposition process of L-cysteine during the thermal heating instead of melting process [51,52]. The thermograms of both the samples showed two endothermic peaks during the thermal heating process. The results indicated the minor changes in the peak temperature of both the peaks of the Biofield Energy Treated sample; however, the latent heat ($\Delta H_{\text{decomposition}}$) corresponding to both peaks were significantly altered compared with the control sample. The treated sample showed a slight reduction in the peak temperature corresponding to 1st and 2nd peak by 0.20% and 0.40%; while the $\Delta H_{\text{decomposition}}$ was significantly altered by 11.45% and 20.79%, respectively compared to the control sample (Table 3). The DSC results revealed that the decomposition temperatures of the treated sample were similar as that of the control sample, whereas the latent heat corresponding to those temperatures was significantly increased that may occur due to some alterations in the crystal structure and molecular pattern of the L-cysteine [51,53] after the Biofield Energy Treatment. Hence, the thermal decomposition pattern of the Biofield Energy Treated was altered with respect to its latent heat compared to the control L-cysteine sample.

Table 3: Comparison of DSC data between the control and Biofield Energy Treated L-cysteine

| Peak | Description | Melting Point (°C) | ΔH_{fusion} (J/g) |
|--------|--------------------------------|--------------------|----------------------------------|
| Peak 1 | Control sample | 178.07 | 23.14 |
| | Biofield Energy Treated sample | 177.72 | 25.79 |
| | % Change | -0.20 | 11.45 |
| Peak 2 | Control sample | 221.04 | 528.10 |
| | Biofield Energy Treated sample | 220.16 | 637.90 |
| | % Change | -0.40 | 20.79 |

ΔH : Latent heat of fusion.

Thermal Gravimetric Analysis (TGA)/ Differential Thermogravimetric Analysis (DTG)

The TGA thermograms of the control and treated samples showed a significant weight loss of L-cysteine during the thermal degradation (Figure 3) and the pattern of degradation of both the samples during the heating was found similar as reported in the previous scientific studies [52]. Further data of the thermograms revealed a significant reduction in the weight loss of the treated sample compared to the control sample. The treated sample showed a 93.94% weight loss during the thermal heating that was found to be reduced by 5.59% in comparison to the total weight loss of the control sample (99.50%). Hence, the resultant residue weight of the treated sample was increased significantly by 1111.20% compared to the control L-cysteine sample (Figure 4). Moreover, the DTG analysis (Table 4) of the control and the treated sample indicated a slight alteration in the maximum thermal degradation temperature (T_{max}) of the Biofield Energy Treated

L-cysteine in comparison with the control sample. The T_{max} of the control sample was observed as 221.06°C; while it was slightly reduced by 0.50% in the treated sample and found as 219.96 °C. Hence, the overall TGA/DTG studies indicated the increased thermal stability of the Biofield Energy Treated sample after the Biofield Energy Treatment in comparison with the control L-cysteine sample.

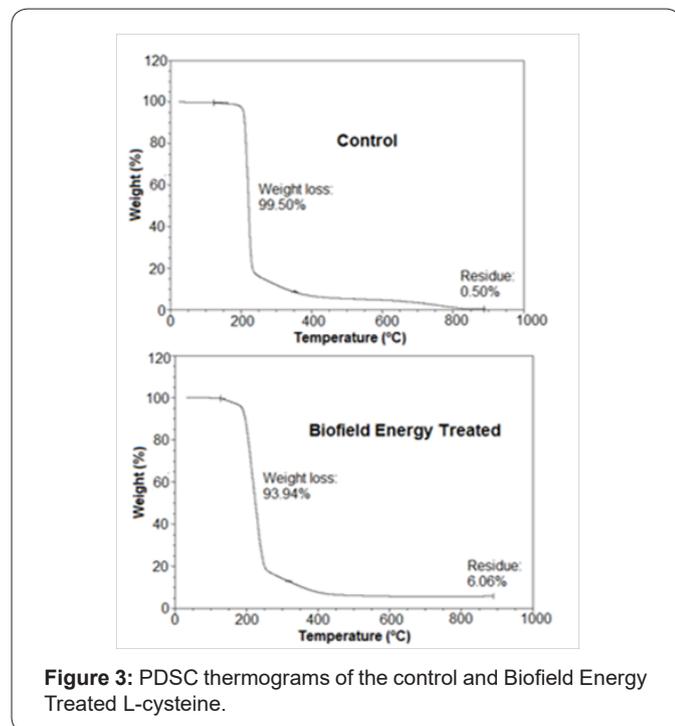


Figure 3: PDSC thermograms of the control and Biofield Energy Treated L-cysteine.

Table 4: TGA/DTG data of the control and Biofield Treated samples of L-cysteine.

| Sample | TGA | | DTG |
|-------------------------|-----------------------|-----------|----------------|
| | Total weight loss (%) | Residue % | T_{max} (°C) |
| Control | 99.50 | 0.50 | 221.06 |
| Biofield Energy Treated | 93.94 | 6.06 | 219.96 |
| % Change | -5.59 | 1111.20 | -0.50 |

T_{max} = the temperature at which maximum weight loss takes place in TG or peak temperature in DTG.

Conclusion

This scientific study was performed to analyze the alterations in the physicochemical and thermal properties of L-cysteine that may arise due to the impact of the Trivedi Effect®-Consciousness Energy Healing Treatment in comparison to the control sample. The Biofield Energy Treated sample showed significant changes in the particle size distribution pattern that was observed to be reduced at d^{10} , d^{50} , d^{90} , and $D(4, 3)$ by 10.18%, 12.97%, 16.83%, and 14.36%, respectively, compared with the particle size values of the control L-cysteine sample. The resultant impact was also seen on the specific surface area of the Biofield Energy Treated sam-

ple after the Biofield Energy Treatment as it was significantly increased by 14.29% compared with the control L-cysteine sample. The PXRD data of both the samples revealed significant changes in the positioning of characteristics peaks of the Biofield Energy Treated sample along with the highest peak intensity compared with the peaks of the control L-cysteine's diffractogram. The peaks having similar Bragg's angles of the Biofield Energy Treated sample as that of the control sample also showed alterations in their peak intensities ranging from -47.62% to 110.11% and in crystallite sizes ranging from -17.74% to -74.57% in comparison to the control sample. The average crystallite size of the Biofield Energy Treated L-cysteine was also found to be significantly reduced by 49.81% compared with the control sample. The presence of two endothermic peaks in the DSC thermograms of the control and Biofield Energy Treated sample, which denoted their thermal decomposition. The $\Delta H_{decomposition}$ of the 1st and 2nd endothermic peaks were significantly increased by 11.45% and 20.79%, respectively, compared with the control L-cysteine sample.

The Biofield Energy Treated sample indicated the increased thermal stability after the Biofield Energy Treatment as the total weight loss during the thermal heating was reduced by 5.59% in comparison to the control sample, which therefore causes a remarkable increase in the residue weight by 1111.20% compared with the control L-cysteine sample. The overall analysis on the L-cysteine sample revealed the impact of the Biofield Energy Treatment on the sample that causes the decrease in particle sizes and increased specific surface area, which might help in increasing the solubility, absorption, and bioavailability of the Biofield Energy Treated sample. The impact of the Trivedi Effect® was also found on the crystalline and thermal properties of L-cysteine as the Biofield Energy Treated sample showed altered crystallinity that might form a novel polymorph with improved thermal stability of the sample, compared to the control sample. Thus, the Biofield Energy Treated L-cysteine could be useful in formulations (i.e., food, cosmetics, pharmaceuticals, etc.) which might improve the bioavailability and more efficacious in the treatment against cardiovascular disease, inflammation, angina, chronic bronchitis, chronic obstructive pulmonary disease (COPD), diabetes, osteoarthritis, flu, inflammatory bowel disease, etc.

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