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Impact of Consciousness Energy Healing Treatment on the Physicochemical and Thermal Properties of an Anticancer Drug 6-Mercaptopurine

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Research Article

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Abstract

Mercaptopurine is an antineoplastic chemotherapy drug is used for the treatment of cancer, Crohn's disease, ulcerative colitis, autoimmune diseases, etc. In this scientific study, the impact of the Trivedi Effect®-Consciousness Energy Healing Treatment on the physicochemical and thermal properties of 6-mercaptopurine was evaluated using the modern analytical technique. The test sample 6-Mercaptopurine powder was divided and named into control and treated sample. The control sample did not receive the Biofield Energy Treatment; whereas, the treated sample received the Biofield Energy Treatment remotely by a well-known Biofield Energy Healer, Gopal Nayak. The particle size values in the treated 6-mercaptopurine sample were significantly decreased by 10.18% (d_{10}), 10.59% (d_{50}), 7.62% (d_{90}), and 9.17% {D(4,3)}; thus, the specific surface area was significantly increased by 10.28% compared to the control sample. The powder XRD peak intensities and crystallite sizes of the treated 6-mercaptopurine were significantly altered ranging from -43.40% to 23.33% and -37.09% to 136.67%, respectively; whereas the average crystallite size was significantly decreased by 11.04% compared with the control sample. The latent heat of evaporation and latent heat of fusion of the treated 6-mercaptopurine were significantly increased by 11.81% and 14.97% compared with the control sample. The total residue amount was significantly increased by 6.44% in the treated sample compared with the control sample. The maximum thermal degradation temperature of the 1st, 2nd, and 3rd peaks of the treated sample was altered by 1.55%, 0.18%, and -1.29% compared with the control sample. It was concluded that the Trivedi Effect®-Consciousness Energy Healing Treatment might have generated a new polymorphic form of 6-mercaptopurine which would offer better solubility, absorption, and bioavailability compared with the control sample. The Biofield Energy Treated 6-mercaptopurine would be more efficacious against acute lymphocytic leukemia, chronic myeloid leukemia, Crohn's disease, ulcerative colitis, and autoimmune diseases.

Keywords: 6-mercaptopurine; The Trivedi Effect®; Complementary and Alternative Medicine; Consciousness Energy Healing Treatment; Particle size; Surface Area; PXRD; DSC; TGA/DTG.

Abbreviations: NIH: National Institutes of Health; NCCAM: National Center for Complementary and Alternative Medicine; CAM: Complementary and Alternative Medicine; PSA: Particle Size Analysis; PXRD: Powder X-Ray Diffraction; DSC: Differential Scanning Calorimetry; TGA/DTG: Thermogravimetric Analysis/ Differential Thermogravimetric Analysis; FWHM: Full Width at Half Maximum; SSA: Specific Surface Area.

Introduction

Mercaptopurine is an antineoplastic (or cytotoxic) chemotherapy drug belongs to a thiopurine-derivative antimetabolite. It inhibits the purine nucleotide synthesis and metabolism by hindering an enzyme called phosphoribosyl pyrophosphate amidotransferase interference [1,2]. It is used unaided or in combination with other anti-cancer medications for the management of chronic myeloid leukaemia, acute lymphocytic leukaemia, ulcerative colitis, autoimmune diseases, and Crohn's disease [3-5]. World Health Organization recommended it as an essential medicine and also approved since from 1953 for the medical use in the USA [6]. Some of the side effects related to the use of 6-mercaptopurine are nausea, vomiting, diarrhoea, stomach and abdominal pain, loss of appetite, mouth sores, yellowing of skin or eyes, fatigue, weakness, fever, sore throat, red spots on the skin, skin rash, darkening of the skin, hair loss, easy bruising or bleeding, black stools, bloody stools, dark urine, bloody urine, suppress the production of red and white blood cells, and genetic polymorphisms [7-9].

Mercaptopurine available in the form of tablets and liquid suspensions formulations for the administration [10-12]. The 6-mercaptopurine is insoluble in water, chloroform, acetone, diethyl ether, hot alcohol and dilute alkali solutions; slightly soluble in dilute sulphuric acid, but in it is soluble [12]. Scientists throughout the world doing the widespread research work in order to advance the solubility, dissolution, absorption, and bioavailability of the pharmaceutical and nutraceutical compounds [13]. The Trivedi Effect®- Consciousness Energy Healing Treatment fascinated to have a significant impact on the crystallite properties, particle properties, thermal behaviour, and bioavailability of the pharmaceutical and nutraceutical compounds [14-17]. The Trivedi Effect® is a natural and only scientifically established phenomenon in which a specialized person can harness this inherently intelligent energy from the "Universe" and transfer it anywhere on the planet *via* the possible mediation of neutrinos [18]. An infinite and para-dimensional electromagnetic field which be present surrounding the body of every living organism generated by continues moment of the charged particles (ions, cells) blood flow, heart movement, etc. inside the body is called a "Biofield". The Biofield based Energy Healing Therapy, which was accepted and approved worldwide for its use against many diseases by the National Institutes of Health (NIH) and National Center for Complementary and Alternative Medicine (NCCAM) and included it under the Complementary and Alternative Medicine (CAM) along with hypnotherapy, meditation, yoga, Reiki, Ayurvedic medicine, traditional Chinese herbs and medicines in biological systems, etc. The CAM has been accepted by most of the USA people [19,20]. The Biofield Energy Treatment is important for the overall improvement of the quality of life and various other health conditions [21,22]. The Trivedi Effect®-Consciousness Energy Healing Treatment has a significant impact on the characteristic properties of metals, ceramics, and polymers, organic compounds, microbes, cancer cells [23-30], and also improve the yield of crops [31,32]. This study was designed to evaluate the influence of the Trivedi Effect®-Consciousness Energy Healing Treatment on the physicochemical and thermal properties of 6-mercaptopurine using particle size analysis (PSA), powder X-ray diffraction (PXRD), differential scanning calorimetry (DSC), and thermogravimetric analysis/ differential thermogravimetric analysis (TGA/DTG).

Materials and Methods

Chemicals and Reagents

6-Mercaptopurine monohydrate was purchased from Tokyo Chemical Industry Co., Ltd., Japan and the other chemicals were purchased in India.

Consciousness Energy Healing Treatment Strategies

The test sample 6-mercaptopurine powder was divided into two parts. One part of the test sample was treated with the Trivedi Effect®-Consciousness Energy Healing Treatment remotely under standard laboratory circumstances for 3 minutes by the well-known Biofield Energy Healer, Gopal Nayak, India, and known as a Biofield Energy Treated 6-mercaptopurine. However, the other part of the 6-mercaptopurine test sample did not receive the Biofield Energy Treatment but, was treated with a "sham" healer and considered as a control sample. The "sham" healer totally ignorant about the Biofield Energy Treatment. After the treatment, both the samples

were kept in sealed conditions and characterized using modern analytical techniques.

Characterization

The PSA, PXRD, DSC, and TGA analysis of the control and Biofield Energy Treated 6-mercaptopurine were performed. The PSA was performed with the help of Malvern Mastersizer 2000 (UK) using the wet method [33,34]. The PXRD analysis of the test samples was performed with the help of Rigaku MiniFlex-II Desktop X-ray diffractometer (Japan) [35,36]. 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 (FWHM), and θ is the Bragg angle [37].

Similarly, the DSC analysis of the test samples was performed with the help of DSC Q200, TA Instruments. The TGA/DTG thermograms also performed with the help of TGA Q50 TA instruments [33,34].

The % change in particle size, specific surface area, peak intensity, crystallite size, melting point, latent heat, weight loss, and the maximum thermal degradation temperature of the Biofield Energy Treated sample was calculated compared with the control sample using the following equation 2:

$$\% \text{ change} = \frac{[\text{Treated} - \text{Control}]}{\text{Control}} \times 100 \quad (2)$$

Results and Discussion

Particle Size Analysis (PSA)

The particle size and surface area analysis data of both the control and Biofield Energy Treated 6-mercaptopurine were presented in Table 1. The particle size values in the treated mercaptopurine powder sample were significantly decreased by 10.18% (d_{10}), 10.59% (d_{50}), 7.62% (d_{90}), and 9.17% {D(4,3)} compared to the control sample. The specific surface area (SSA) of the treated 6-mercaptopurine (0.118 m^2/g) was increased by 10.28% compared to the control sample (0.107 m^2/g). The results indicated that the Biofield Energy Healing Treatment might have acted like an exterior force, responsible for the breaking of the larger particles into smaller ones, therefore increased the surface area. The particle size properties have a huge impact on the solubility, absorption, bioavailability, and therapeutic efficacy of any pharmaceutical compound [38,39]. The solubility of mercaptopurine is very poor in many organic solvents [12]. Thus, the Biofield Energy Treated 6-mercaptopurine would the better for the pharmaceutical formulations, which may be more efficacious with improved solubility, dissolution, and absorption.

Parameter	d_{10} (µm)	d_{50} (µm)	d_{90} (µm)	D(4,3) (µm)	SSA (m^2/g)
Control	31.05	89.02	175.9	97.31	0.107
Biofield Energy Treated	27.89	79.6	162.51	88.39	0.118
Percent change (%)	-10.18	-10.59	-7.62	-9.17	10.28

Table 1: Particle size distribution and surface area of the control and Biofield Energy Treated 6-mercaptopurine.
d_{10}, d_{50}, and d_{90}: particle diameter corresponding to 10%, 50%, and 90% of the cumulative distribution, SSA: the specific surface area, and D(4,3): the average mass-volume diameter.

Powder X-ray Diffraction (PXRD) Analysis

The PXRD diffractograms of both the 6-mercaptopurine powder samples showed sharp and intense peaks in the diffractograms (Figure 1), this indicated that both the samples were crystalline. The control and Biofield Energy Treated samples showed the highest peak intensity at 2θ near to 27.57° and 27.47° (Table 2, entry 11). The peak intensities of the treated 6-mercaptopurine were significantly altered ranging from -43.40% to 23.33% compared to the control sample. Similarly, the crystallite sizes of the treated 6-mercaptopurine were significantly altered ranging from -37.09% to 136.67% compared to the control sample. Though, the average crystallite size of the Biofield Energy Treated 6-mercaptopurine (266.50 nm) was significantly decreased by 11.04% compared with the control sample (299.58 nm).

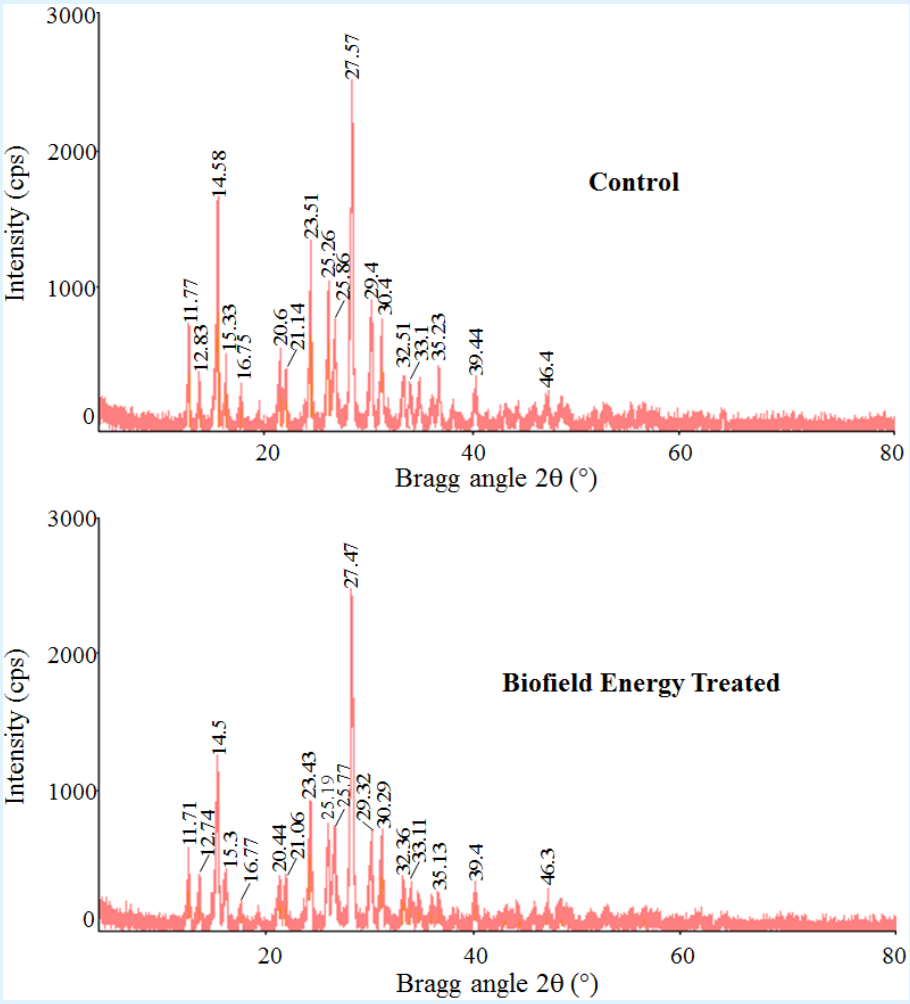

Figure 1: PXRD diffractograms of the control and Biofield Energy Treated 6-mercaptopurine.

Entry No.	Bragg angle (°2θ)		Peak Intensity (%)			Crystallite size (G, nm)		
	Control	Treated	Control	Treated	% change	Control	Treated	% change
1	11.77	11.71	100	81	-19	361	301	-16.62
2	12.83	12.74	44	49	11.36	304	252	-17.11
3	14.58	14.5	284	249	-12.32	293	239	-18.43
4	15.33	15.3	77	78	1.3	364	229	-37.09
5	16.75	16.77	32.7	20	-38.84	428	357	-16.59
6	20.6	20.44	82	71	-13.41	265	237	-10.57
7	21.14	21.06	62	59	-4.84	307	258	-15.96
8	23.51	23.43	215	205	-4.65	325	266	-18.15
9	25.26	25.19	173	136	-21.39	360	306	-15
10	25.86	25.77	153	171	11.76	291	242	-16.84

11	27.57	27.47	506	525	3.75	291	258	-11.34
12	29.4	29.32	177	126	-28.81	264	241	-8.71
13	30.4	30.29	146	127	-13.01	300	299	-0.33
14	32.51	32.36	69	60	-13.04	301	250	-16.94
15	33.1	33.11	59	46	-22.03	311	249	-19.94
16	35.23	35.13	30	37	23.33	261	251	-3.83
17	35.93	35.84	57	44	-22.81	284	222	-21.83
18	39.44	39.4	52	47	-9.62	180	426	136.67
19	46.4	46.3	53	30	-43.4	202	215	6.44
20	Average crystallite size					299.58	266.5	-11.04

Table 2: PXRD data for the control and Biofield Energy Treated 6-mercaptopurine.

The change in the crystal morphology responsible for the change in the peak intensity of each diffraction face on the crystalline compound [40]. The alterations in the XRD pattern provide the evidence of polymorphic transitions [41,42]. Therefore, the Trivedi Effect®-Consciousness Energy Healing Treatment probably produced the new polymorphic form of mercaptopurine through the Biofield Energy *via* neutrino oscillations [18]. Thus, the treated mercaptopurine would show the significant effects on the drug performance, i.e., bioavailability and therapeutic efficacy because of their modified physicochemical properties like from the original one [43,44].

Differential Scanning Calorimetry (DSC) Analysis

Both the thermograms of control and Biofield Energy Treated sample presented the two sharp endothermic peaks (Figure 2). The 1st endothermic peak represents the evaporation of the bounded water and the 2nd endothermic peak indicated the melting point. The data closely matched to the data reported in the literature [44]. The evaporation temperature and the melting point of the Biofield Energy Treated 6-mercaptopurine did not show many alterations compared with the control sample (Table 3). However, latent heat of evaporation ($\Delta H_{evaporation}$) and latent heat of fusion (ΔH_{fusion}) of the treated 6-mercaptopurine was significantly increased by 11.81% and 14.97% compared with the control sample (Table 3). The change in the latent heat of (ΔH) can be attributed to the altered molecular chains and the crystal structure [45]. Thus, the Trivedi Effect®-Consciousness Energy Healing Treatment might have altered the molecular chains and crystal structure of mercaptopurine. Hence, increased the thermal stability of the Consciousness Energy Healing Treated 6-mercaptopurine compared to the control sample. The increased thermal stability will help the product for long term storage and improve self-life.

Sample	Evaporation Temp (°C)	Melting Point (°C)	ΔH (J/g)	
			Evaporation	Fusion
Control Sample	174.46	330.45	277.7	106.2
Biofield Energy Treated	174.41	329.56	310.5	122.1
% Change	-0.03	-0.27	11.81	14.97

Table 3: DSC data for both control and Biofield Energy Treated samples of 6-mercaptopurine.

ΔH: Latent heat of evaporation/decomposition.

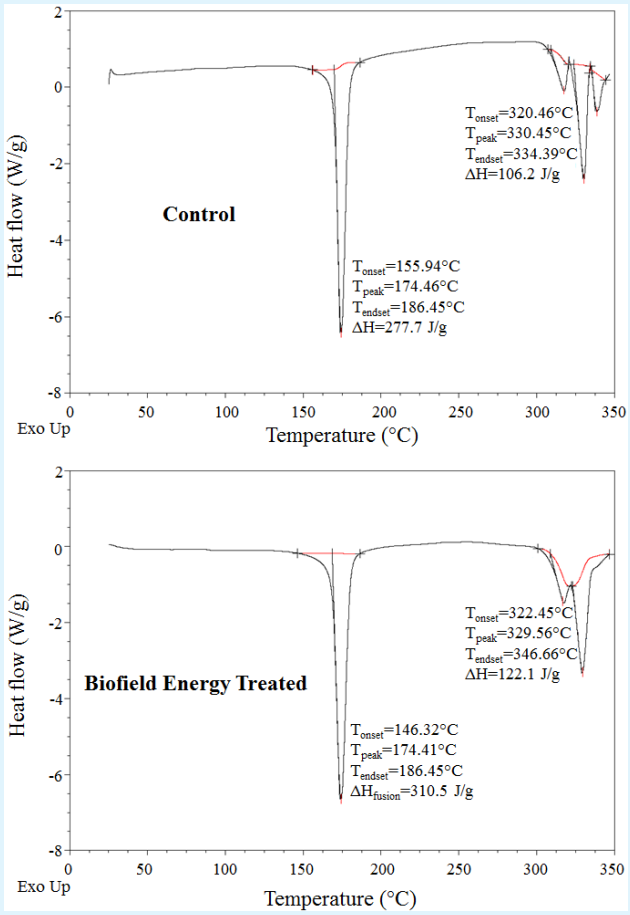

Figure 2: DSC thermograms of the control and Biofield Energy Treated 6-mercaptopurine.

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

The thermograms of both the 6-mercaptopurine samples showed three steps of thermal degradation (Figure 3). The total weight loss of the Biofield Energy Treated sample was reduced by 0.89% compared to the control sample (Table 4). However, the residue amount was increased by 6.44% in the Biofield Energy Treated sample compared to the control sample (Table 4).

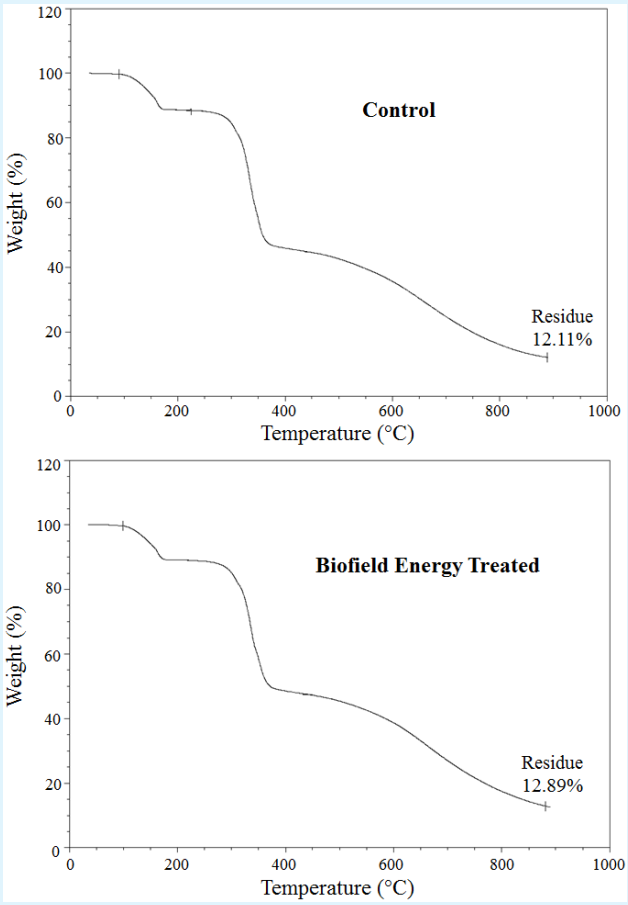

Figure 3: TGA thermograms of the control and Biofield Energy Treated 6-mercaptopurine.

Sample	TGA		DTG; T_{max} (°C)		
	Total weight loss (%)	Residue %	1st Peak	2nd Peak	3rd Peak
Control	87.89	12.11	159.86	333.7	670
Biofield Energy Treated	87.11	12.89	162.34	334.3	661.3
% Change	-0.89	6.44	1.55	0.18	-1.29

Table 4: TGA/DTG data of the control and Biofield Energy Treated samples of 6-mercaptopurine.

T_{max} = the temperature at which maximum weight loss takes place in TGA.

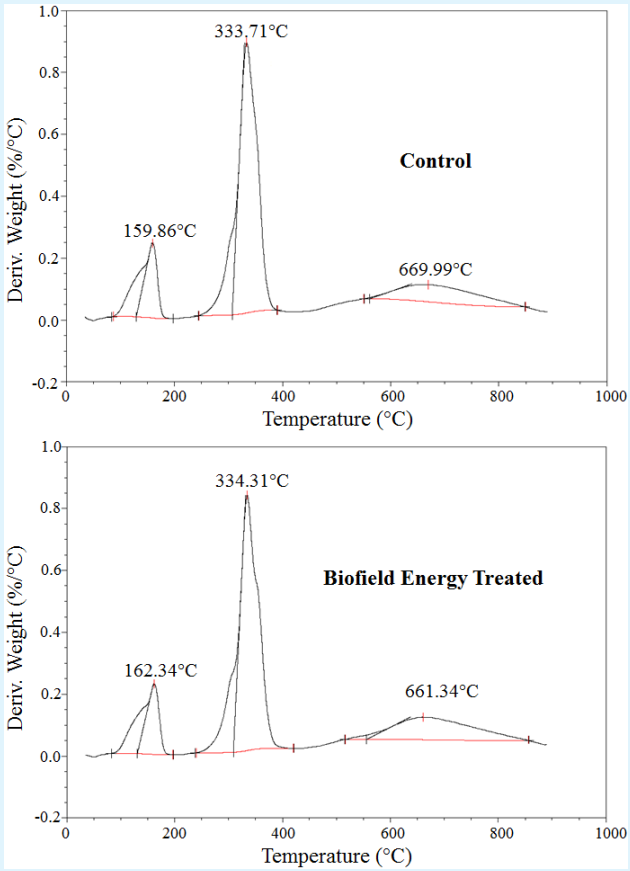

Figure 4: DTG thermograms of the control and Biofield Energy Treated 6-mercaptopurine.

Similarly, both the 6-mercaptopurine samples showed three peaks in the DTG thermograms (Figure 4). The maximum thermal degradation temperature (T_{max}) of the 1st, 2nd, and 3rd peaks of the Biofield Energy Treated 6-mercaptopurine were altered by 1.55%, 0.18%, and -1.29% compared with the control sample (Table 4). Overall, thermal analysis data of 6-mercaptopurine samples revealed that the thermal stability of the Biofield Energy Treated 6-mercaptopurine sample was increased compared with the control sample.

Conclusions

The experimental results have shown that the Trivedi Effect®-Consciousness Energy Healing Treatment has a significant impact on the particle, crystal, and thermal properties of 6-mercaptopurine. The particle size values in the Biofield Energy Treated 6-mercaptopurine sample were significantly decreased by 10.18% (d_{10}), 10.59% (d_{50}), 7.62% (d_{90}), and 9.17% {D(4,3)}; thus, the specific surface area was significantly increased by 10.28% compared to the control sample. The powder XRD peak intensities and crystallite sizes of the Biofield Energy Treated 6-mercaptopurine were significantly altered ranging from -43.40% to 23.33% and -37.09% to 136.67%, respectively; whereas the average crystallite size was significantly decreased by 11.04% compared with the control sample. The $\Delta H_{evaporation}$ and ΔH_{fusion} of the Biofield Energy Treated 6-mercaptopurine were significantly increased by 11.81% and 14.97% compared with the control sample. The total residue amount was significantly increased by 6.44% in the Biofield Energy Treated sample compared with the control sample. The T_{max} of the 1st, 2nd, and 3rd peaks of the Biofield Energy Treated sample was altered by 1.55%, 0.18%, and -1.29% compared with the control sample. It was concluded that the Trivedi Effect®-Consciousness Energy Healing Treatment might have generated a new polymorphic form of 6-mercaptopurine which would offer better solubility, absorption, and bioavailability compared with the control sample. The Biofield Energy Treated 6-mercaptopurine would be more efficacious against acute lymphocytic leukemia, chronic myeloid leukemia, Crohn's disease, ulcerative colitis, and autoimmune diseases.

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