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Spectroscopic and Calorimetric Evaluation of the Biofield Energy Healing Treated Ofloxacin

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Abstract

Ofloxacin is an antibiotic useful for the treatment of bacterial infections. The aim of this research work was to evaluate the impact of the Trivedi Effect®-Consciousness Energy Healing Treatment on the physicochemical properties of ofloxacin using modern analytical techniques. The sample was divided into control and Biofield Energy Treated parts. The control sample did not receive the Biofield Energy Treatment; whereas, the treated part received the Biofield Treatment remotely by a famous Biofield Energy Healer, Gopal Nayak. The PXRD peak intensities and crystallite sizes were significantly altered ranging from -39.33% to 127.93% and -68.28% to 21%, respectively; however, the average crystallite size of the treated ofloxacin (236.59nm) was decreased by 19.48% compared with the control sample (293.83nm). The particle size values were significantly decreased at d_{10} (10.67%), d_{50} (25%), d_{90} (24.4%), and D (4,3) (25.12%); thus, the specific surface area was significantly increased by 9.8% in the treated sample compared to the control sample. The latent heat of fusion and the latent heat of decomposition of the treated sample were significantly increased by 11.71% and 123.52%, respectively compared to the control sample. The total weight loss was significantly decreased by 10.59%; however, the residue amount was significantly increased by 63.29% in the treated ofloxacin compared with the control sample. The Trivedi Effect®-Consciousness Energy Healing Treatment generated a new polymorphic form of ofloxacin which may be more soluble, bioavailable, and be thermally more stable compared to the untreated sample. The treated ofloxacin would be more efficacious against cellulitis, prostatitis, chronic bronchitis, urinary tract infections, infections of the urethra and cervix, pneumonia, infectious diarrhoea, plague, etc.

Keywords: Ofloxacin; The Trivedi Effect®, Complementary and alternative medicine; Consciousness Energy Healing Treatment; Crystal size; Particle size; DSC; TGA/DTG

Introduction

Ofloxacin is an antibiotic useful for the treatment of the infections caused by bacteria [1]. It restricts the bacterial cell division by inhibiting its DNA gyrase (type II topoisomerase and topoisomerase IV) [2]. Clinically it is useful for the treatment of bacterial infections, i.e., urethral, urinary tract, and cervix infection, cellulitis, chronic bronchitis, pneumonia, prostatitis, infectious diarrhoea, plague, multidrug-resistant tuberculosis, bacterial infection of the eye and ear, otitis media when there is a hole in the eardrum, etc. [1, 3,4]. It may inhibit drug metabolizing enzymes and thus increases the theophylline, cyclosporine, warfarin, etc. levels in the blood. The common side effects involved with it are a headache, vomiting, diarrhoea, numbness, tendon rupture, skin rash, psychosis, seizures, etc. [1]. It increases the cardiotoxicity, anticoagulant, and arrhythmias effect when co-administered with drugs such as acenocoumarol, dihydroquinidine, barbiturate, etc. [4,5]. The limitation to the ofloxacin is short biological half-life, and its bioavailability is highly dependent on the physiological condition of the gastrointestinal tract. It is highly soluble in acidic media thus precipitates in alkaline media and lose its solubility [4].

The physicochemical properties of a pharmaceutical/nutraceutical compound play a crucial role in its dissolution, absorption, distribution, and bioavailability in the physiological system [6]. Many scientific research works are going on for the improvement of these parameters of the pharmaceutical/nutraceutical compounds in the formulations. Surprisingly, the Trivedi Effect®-Biofield Energy Healing Treatment has found to be an economical approach for the alteration of the physicochemical properties and bioavailability of the pharmaceutical/nutraceutical compounds [7-10]. The Trivedi Effect® is natural and is the only scientifically proven phenomenon in which a person can harness this inherently intelligent energy and transmit it anywhere on the planet *via* the possible mediation of neutrinos [11]. Every biological subject possesses a unique electromagnetic field surrounding its body called the "Biofield", which is infinite and para-dimensional. It is generated from the continuous moment of charged particles, cells, blood flow, movement of the heart, etc. in the body.

The "Biofield" based Energy Healing Therapies have been reported with significantly beneficial outcomes against various

disease conditions [12]. The National Centre for Complementary and Alternative Medicine (NCCAM) and National Institutes of Health (NIH) recommend and included the Energy therapy under the Complementary and Alternative Medicine (CAM) category along with homeopathy, Ayurvedic medicine, naturopathy, traditional Chinese herbs and medicines, massage, acupuncture, acupressure, yoga, meditation, healing touch, Reiki, hypnotherapy, Qi Gong, Tai Chi, deep breathing, special diets, aromatherapy, guided imagery, chiropractic/osteopathic manipulation, movement therapy, Rolfing structural integration, cranial sacral therapy, mindfulness, and applied prayer. Most of the people throughout the globe have accepted the CAM with several advantages [13,14].

The Trivedi Effect®-Consciousness Energy Healing Treatment (Biofield Energy Treatment) also has the outstanding capability to alter the characteristic properties of the many living and non-living object(s), i.e., microorganisms, cancer cell line, live stocks, agricultural plants, metals and ceramics, and organic compounds [15-21]. In this experiment, the Trivedi Effect®-Consciousness Energy Healing Treatment on the physicochemical, and thermal properties of ofloxacin was evaluated using powder X-ray diffraction (PXRD), particle size analysis (PSA), differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA)/Differential thermogravimetric analysis (DTG).

Materials and Methods

Chemicals and Reagents

All the chemicals and reagents used during the experiment were of the analytical standard. The main chemical used in the experiment was ofloxacin (Sigma Aldrich, USA) and other reagents were purchased from India.

Consciousness Energy Healing treatment Strategies

The test sample (ofloxacin) was divided into control and the Biofield Energy Treated sample. The control sample did not receive Biofield Energy Treatment. But the control sample was treated with a "sham" healer, who did not have any knowledge about the Biofield Energy Treatment. Similarly, the other part of the sample so called the Biofield Energy Treated sample was received the Consciousness Energy Healing Treatment remotely under standard laboratory conditions for 3 minutes. The Biofield Treatment was provided through the healer's unique energy transmission process by the famous Biofield Energy Healer, Gopal Nayak, India, to one part of the test sample. After the treatment, the Biofield Energy Treated and untreated samples were kept in sealed conditions and characterized using modern analytical techniques.

Characterization

Powder X-ray Diffraction (PXRD) Analysis

The XRD analysis of ofloxacin powder sample was executed with the help of Rigaku MiniFlex-II Desktop X-ray diffractometer (Japan) [22,23]. The average size of individual crystallites was calculated from XRD data using the Scherrer's formula (1):

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

Where k is the equipment constant (0.94), G is the crystallite size in nm, λ is the radiation wavelength (0.154056 nm for Kα1 emission), β is the full-width at half maximum (FWHM), and θ is the Bragg angle [24].

The % change in crystallite size (G) of ofloxacin was calculated using the following equation 2:

$$\%\ change\ in\ crystallite\ size = \frac{G_{Treated} - G_{Control}}{G_{Control}} x100 \qquad (2)$$

Where $G_{Control}$ and $G_{Treated}$ are the crystallite size of the control and the Biofield Energy Treated samples, respectively.

Particle Size Analysis (PSA)

The particle size analysis of ofloxacin powder was executed on Malvern Mastersizer 2000, from the UK using the wet method [7,8]. The percent change in particle size (d) for ofloxacin was calculated using the following equation 3:

$$\%\ change\ in\ particle\ size = \frac{d_{Treated} - d_{Control}}{d_{Control}} x100 \qquad (3)$$

Where $d_{Control}$ and $d_{Treated}$ are the particle size (μm) for at below 10% level (d_{10}), 50% level (d_{50}), and 90% level (d_{90}) of the control and the Biofield Energy Treated samples, respectively.

The percent change in surface area (S) was calculated using the following equation 4:

$$\%\ change\ in\ surface\ area = \frac{S_{Treated} - S_{Control}}{S_{Control}} x100 \qquad (4)$$

Where $S_{Control}$ and $S_{Treated}$ are the surface area of the control and the Biofield Energy Treated ofloxacin, respectively.

Differential Scanning Calorimetry (DSC)

The DSC analysis of ofloxacin was performed with the help of DSC Q200, TA instruments. The sample of ~1-3 mg was loaded into the aluminium sample pan at a heating rate of 10ºC/min from 30°C to 350°C [7, 8]. The % change in melting point (T) was calculated using the following equation 5:

$$\%\ change\ in\ melting\ point = \frac{T_{Treated} - T_{Control}}{T_{Control}} x100 \qquad (5)$$

Where, $T_{Control}$ and $T_{Treated}$ are the melting point of the control and treated samples, respectively.

Percent change in the latent heat of fusion (ΔH) was calculated using the following equation 6:

$$\%\ change\ in\ the\ latent\ heat\ of\ fusion = \frac{\Delta H_{Treated} - \Delta H_{Control}}{\Delta H_{Control}} x100 \qquad (6)$$

Where, $\Delta H_{Control}$ and $\Delta H_{Treated}$ are the latent heat of fusion of the control and treated ofloxacin, respectively.

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

The TGA/DTG thermograms of ofloxacin samples were obtained with the help of TGA Q50 TA instruments. A sample of ~3-5 mg was loaded to the platinum crucible at a heating rate of 10ºC/min from 25°C to 1000°C [7, 8]. The % change in weight loss (W) was calculated using the following equation 7:

$$\%\ change\ in\ weight\ loss = \frac{[W_{Treated} - W_{Control}]}{W_{Control}} x100 \quad (7)$$

Where $W_{Control}$ and $W_{Treated}$ are the weight loss of the control and the Biofield Energy Treated ofloxacin, respectively.

The % change in maximum thermal degradation temperature (T_{max}) (M) was calculated using the following equation 8:

$$\%\ change\ in\ T_{max} = \frac{[M_{Treated} - M_{Control}]}{M_{Control}} x100 \quad (8)$$

Where $M_{Control}$ and $M_{Treated}$ are the T_{max} values of the control and the Biofield Energy Treated ofloxacin, respectively.

Results and Discussion

Powder X-ray Diffraction (PXRD) Analysis

The PXRD diffractograms of both the control and Biofield Energy Treated ofloxacin showed sharp and intense peaks (Figure 1). The sharp and intense peaks in the diffractograms indicated that both the samples were crystalline. The control and the treated samples have shown the highest peak intensity at 2θ equal to 5.99° and 6.08°, respectively (Table 1, entry 1). The peak intensities of the Biofield Energy Treated sample were significantly altered ranging from -39.33% to 127.93% compared to the control sample. Similarly, the crystallite sizes of the Biofield Energy Treated sample were significantly altered ranging from -68.28% to 21% compared with the control sample. Overall, the average crystallite size of the treated ofloxacin (236.59 nm) was decreased by 19.48% compared with the control sample (293.83nm).

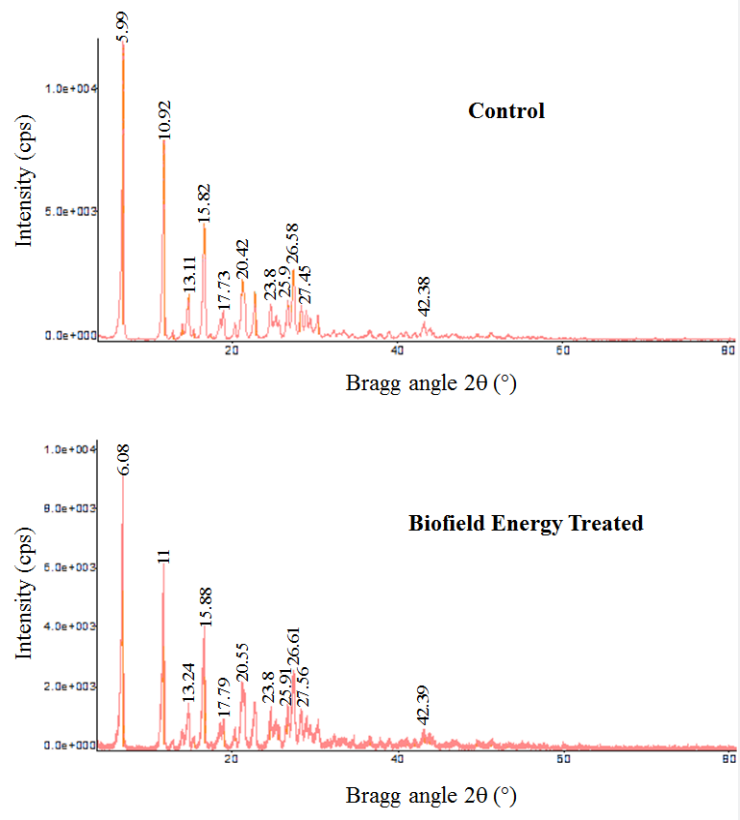

Figure 1: PXRD diffractograms of the control and the Biofield Energy Treated ofloxacin.

Table 1: PXRD data for the control and the Biofield Energy Treated ofloxacin.

Entry No.	Bragg angle (°2θ)		Peak Intensity (%)			Crystallite size (G, nm)		
	Control	Treated	Control	Treated	% change[a]	Control	Treated	% change[b]
1	5.99	6.08	2621	2081	-20.6	405	295	-27.16
2	10.92	11	1674	1268	-24.25	317	255	-19.56
3	13.11	13.24	94	108	14.89	489	271	-44.58

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4	14.51	14.66	89	54	-39.33	345	279	-19.13
5	15.82	15.88	1064	953	-10.43	252	228.6	-9.29
6	17.73	17.79	161	134	-16.77	237	237	0
7	18.14	18.23	248	207	-16.53	282	243	-13.83
8	19.51	19.59	120	96	-20	285	293	2.81
9	20.42	20.55	790	778	-1.52	173	168	-2.89
10	23.8	23.8	254	251	-1.18	278	213	-23.38
11	25.9	25.91	266	274	3.01	298	270	-9.4
12	26.58	26.61	656	730	11.28	240	213	-11.25
13	27.45	27.56	240	290	20.83	439	242	-44.87
14	28.11	28.09	179	408	127.93	309	98	-68.28
15	35.89	35.9	81	59	-27.16	200	242	21
16	42.38	42.39	164	123	-25	227	218	-3.96
17	48.77	48.75	35	32	-8.57	309	302	-2.27
18	50.38	50.39	50	48	-4	204	191	-6.37
19	Average crystallite size					293.83	236.59	-19.48

[a]denotes the percentage change in the intensity of the Biofield Energy Treated sample with respect to the control sample; [b]denotes the percentage change in the crystallite size of the Biofield Energy Treated sample with respect to the control sample.

The crystallite sizes and intensities are interrelated to each other, which indicated the crystal morphology of the Biofield Energy Treated ofloxacin was modified compared to the control sample. The peak intensity of each diffraction face on the crystalline compound changes according to the crystal morphology [25] and alterations in the XRD pattern provide the proof of polymorphic transitions [26,27]. The Consciousness Energy Healing Treatment probably produced a new polymorphic form of ofloxacin *via* neutrino oscillations [11]. Different polymorphic forms of pharmaceuticals/nutraceutical compounds have significant effects on the drug performance from the original form [28,29]. Thus, it can be anticipated that the Biofield Energy Treated ofloxacin would be more efficacious in the pharmaceutical formulations containing ofloxacin. Adenotes the percentage change in the intensity of the Biofield Energy Treated sample with respect to the control sample; bdenotes the percentage change in the crystallite size of the Biofield Energy Treated sample with respect to the control sample.

Particle Size Analysis (PSA)

Table 2: Particle size distribution of the control and the Biofield Energy Treated ofloxacin.

Parameter	d_{10} (µm)	d_{50} (µm)	d_{90} (µm)	D (4,3) (µm)	SSA (m^2/g)
Control	2.34	21.1	208.15	70.48	1.02
Biofield Treated	2.09	15.82	157.36	52.77	1.12
Percent change* (%)	-10.67	-25	-24.4	-25.12	9.8

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. *denotes the percentage change in the Particle size distribution of the Biofield Energy Treated sample with respect to the control sample.

The particle size and surface area analysis data are presented in Table 2. The particle size values of the control sample at d_{10}, d_{50}, d_{90}, and D (4,3) were 2.34µm, 21.10µm, 208.15 µm, and 70.48 µm, respectively. Similarly, the particle sizes of the treated sample at d_{10}, d_{50}, d_{90}, and D (4,3) were 2.09 µm, 15.82 µm, 157.36µm, and 52.77µm, respectively. The particle size values in the Biofield Energy Treated ofloxacin were significantly decreased at d_{10}, d_{50}, d90, and D (4,3) by 10.67%, 25%, 24.4%, and 25.12%, respectively, compared to the control sample. Thus, the specific surface area of the treated sample (1.02 m^2/g) was significantly increased by 9.8% compared with the control sample (0.1.12 m^2/g). Hence, the Trivedi Effect®-Consciousness Energy Healing Treatment assumed to be having a significant effect on the reduction of the particle sizes of ofloxacin powder. Reduction of the particle size increases the surface area and improve the solubility, dissolution rate, and bioavailability in the physiological system [6,30]. The solubility profile of ofloxacin in water, alcohol, dichloromethane, methyl alcohol, and chloroform are poor [31]. Thus, the Trivedi Effect®-Consciousness Energy Healing Treated ofloxacin would be more soluble and bioavailable compared with the untreated sample.

Differential Scanning Calorimetry (DSC) Analysis

DSC data of both control and the Biofield Energy Treated ofloxacin samples are presented in (Table 3). The control and the Biofield Energy Treated sample showed a sharp endothermic peak at 276.61°C and 277.11°C, respectively in the thermogram.

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Similarly, the control and the treated samples showed exothermic peaks at 330.52°C and 331.72°C, respectively (Figure 2). The thermogram pattern and melting point thoroughly matched to the reported data [32]. The melting point and decomposition temperature of the Biofield Energy Treated sample were slightly increased by 0.18% and 0.36%, respectively compared with the control sample (Table 3).

Table 3: DSC data for both control and the Biofield Energy Treated samples of ofloxacin.

Sample	Melting Temp (°C)	Decomposition Temp (°C)	ΔH (J/g)	
			Melting	Decomposition
Control Sample	276.61	330.52	102.5	33.33
Biofield Energy Treated	277.11	331.72	114.5	74.5
% Change*	0.18	0.36	11.71	123.52

ΔH: Latent heat of fusion/decomposition, *denotes the percentage change of the Biofield Energy Treated ofloxacin with respect to the control sample.

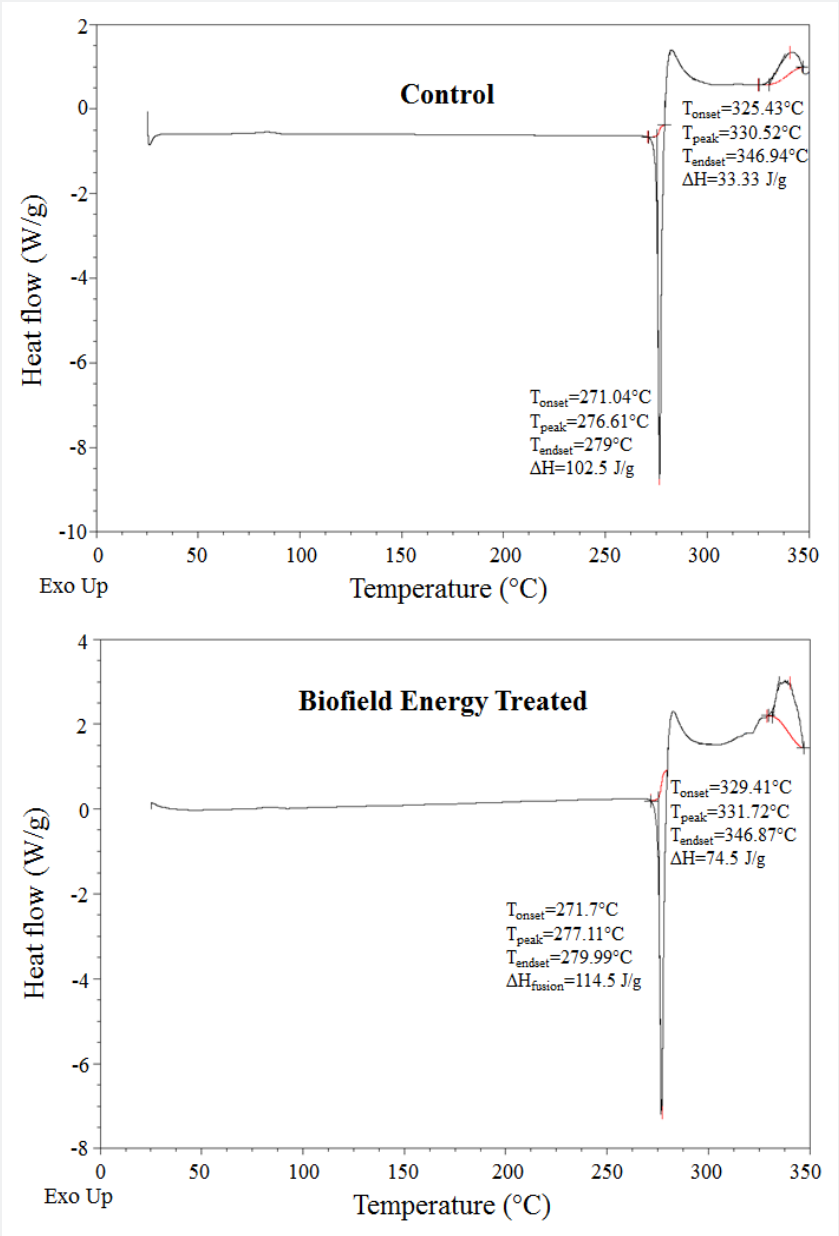

Figure 2: DSC thermograms of the control and the Biofield Energy Treated ofloxacin.

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The latent heat of fusion (ΔH_{fusion}) and the latent heat of decomposition ($\Delta H_{decomposition}$) of the Biofield Energy Treated sample were significantly increased by 11.71% and 123.52% compared with the control sample (Table 3). The change in the latent heat of fusion and decomposition can be attributed to the disrupted molecule chains and the molecular structure. Thus, it can be predicted that the Trivedi Effect® might be responsible for the disruption of the molecular chains and crystal structure of ofloxacin which the cause of improved thermal stability of the treated sample was compared with the control sample.

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

The TGA thermograms of both the samples displayed one step of thermal degradation (Figure 3). The total weight loss in the treated ofloxacin was significantly decreased by 10.59% compared to the control sample (Table 4). However, the residue amount was significantly increased by 63.29% in the Biofield Energy Treated ofloxacin compared with the control sample (Table 4).

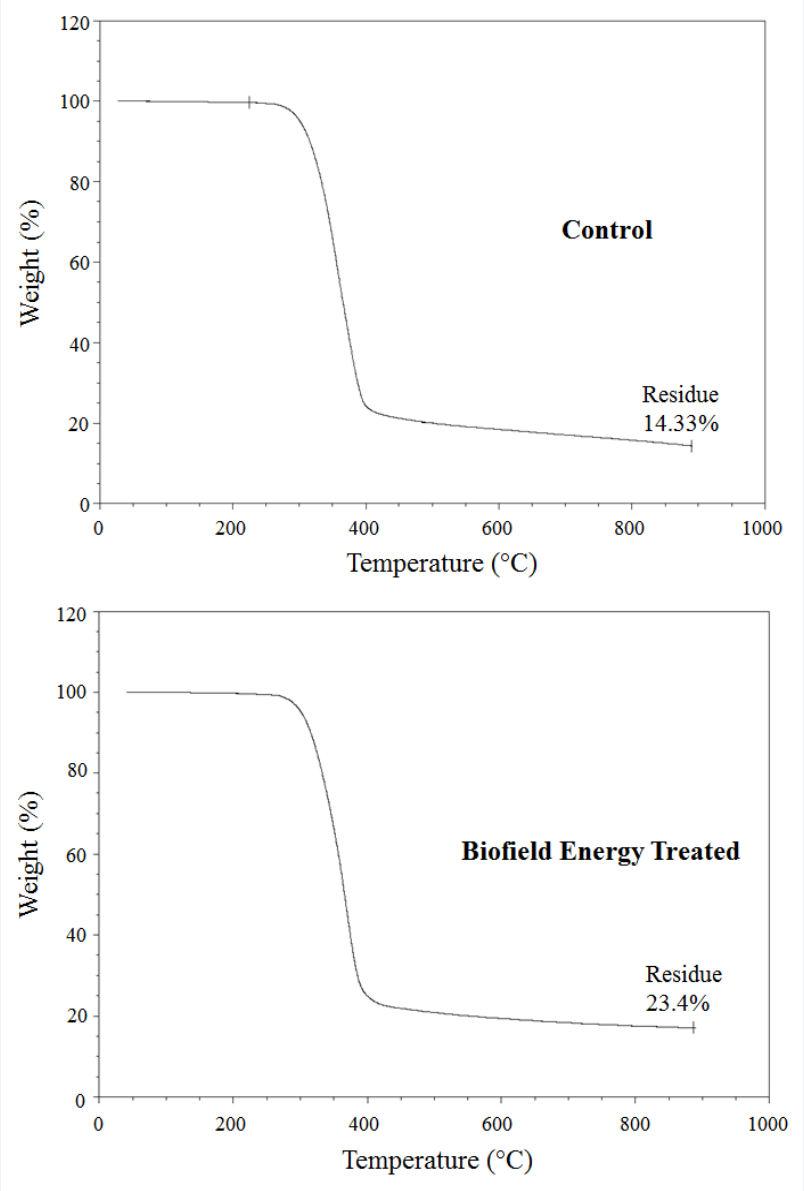

Figure 3: TGA thermograms of the control and the Biofield Energy Treated ofloxacin.

Similarly, the DTG thermograms of both the sample showed only one peak (Figure 4). The maximum thermal degradation temperature (T_{max}) of the treated sample was increased by 2.58% compared with the control sample (Table 4). Overall, TGA/DTG revealed that the thermal stability of the Trivedi Effect®-Consciousness Energy Healing Treated ofloxacin was significantly improved compared with the control sample.

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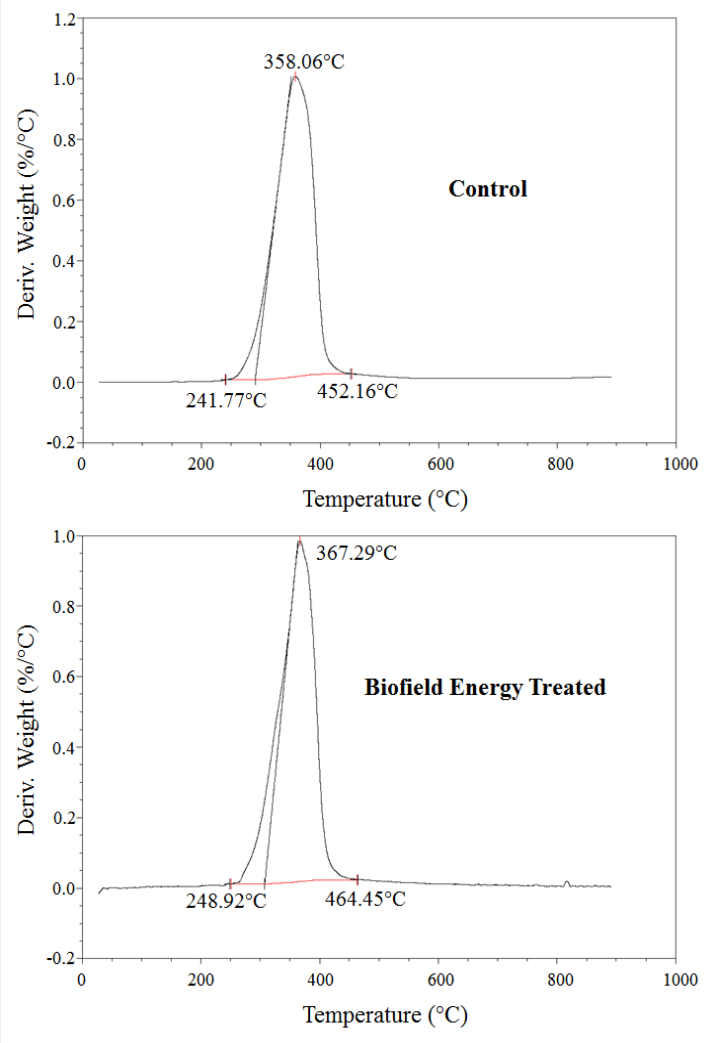

Figure 4: DTG thermograms of the control and the Biofield Energy Treated ofloxacin.

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

Sample	TGA		DTG
	Total weight loss (%)	Residue %	T_{max} (°C)
Control	85.67	14.33	358.06
Biofield Energy Treated	76.6	23.4	367.29
% Change*	-10.59	63.29	2.58

*denotes the percentage change of the Biofield Energy Treated sample with respect to the control sample, T_{max} = the temperature at which maximum weight loss takes place in TG or peak temperature in DTG.

Conclusion

The physicochemical and thermal properties of the Trivedi Effect®-Consciousness Energy Healing Treated ofloxacin were evaluated compared to the control sample. The PXRD peak intensities and crystallite sizes were significantly altered ranging from -39.33% to 127.93% and -68.28% to 21%, respectively; however, the average crystallite size of the Biofield Energy Treated ofloxacin was decreased by 19.48% compared with the control sample. The particle size values were significantly decreased at d_{10} (10.67%), d_{50} (25%), d_{90} (24.4%), and D (4,3) (25.12%); thus, the specific surface area was significantly increased by 9.8% in the Biofield Energy Treated sample compared to the control sample. The latent heat of fusion and the latent heat of decomposition of the Biofield Energy Treated ofloxacin were significantly increased by 11.71% and 123.52%, respectively compared to the control sample. The total weight loss was significantly decreased by 10.59%; however, the residue amount was significantly increased by 63.29% in the Biofield Energy Treated sample compared with

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the control sample. The Trivedi Effect®-Consciousness Energy Healing Treatment generated a new polymorphic form of ofloxacin which may be more soluble, bioavailable, and be thermally more stable compared to the untreated sample. The Consciousness Energy Healing Treated ofloxacin would be very useful for the designing of better pharmaceutical formulations. The treated ofloxacin may offer better therapeutic response against infectious diarrhoea, cellulitis, pneumonia, chronic bronchitis, urinary tract infections, infections of the urethra and cervix (i.e., gonorrhoea), prostatitis, multidrug-resistant tuberculosis, plague, bacterial infection of the eye and ear, etc.

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