

Complementary and Alternative Medicine: Effect of the Consciousness Energy Healing Treatment on Physicochemical Behaviour of Silver Sulfadiazine

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Abstract

Silver sulfadiazine is a topical antibiotic used on burnt tissues to prevent infection. The aim of this study was to evaluate the impact of the Trivedi Effect[®]-Consciousness Energy Healing Treatment on the physicochemical and thermal properties of silver sulfadiazine using PXRD, PSA, DSC, and TGA/DTG analysis. Silver sulfadiazine sample was divided into two parts. One part was considered as a control sample, which did not receive the Biofield Energy Treatment. The second part received the Trivedi Effect[®]-Consciousness Energy Healing Treatment remotely by a renowned Biofield Energy Healer, Alice Branton, termed as the treated sample. The PXRD analysis exhibited that the peak intensities of the treated silver sulfadiazine were significantly decreased from 14.5% to 54.5% compared with the control sample. The crystallite sizes of the treated sample were significantly altered from -48.9% to 6.4% compared to the control sample. The average crystallite size of the Biofield Energy Treated sample was found to be decreased by 13.99% as compared to the control sample. The particle sizes of the treated silver sulfadiazine were decreased significantly by 6.64% at d_{10} followed by d_{50} (-1.37%), d_{90} (-0.55%) and $D(4,3)$ (-2.44%) compared to the control sample. The specific surface area of treated silver sulfadiazine was increased profoundly 11.23% compared to the control sample. The total weight loss was increased by 10.73%; whereas, the residue amount was decreased by 16.49% in the treated silver sulfadiazine compared with the control sample. Thus, the Trivedi Effect[®]-Consciousness Energy Healing Treatment might lead to generate a new polymorphic form of silver sulfadiazine which would be more soluble, and bioavailable compared with the untreated sample. The Consciousness Energy Healing Treated silver sulfadiazine would be very useful to design more efficacious pharmaceutical formulations which might offer a better therapeutic response on the derma against bacteria and superficial and partial thickness burn injuries.

Keywords: Complementary and Alternative Medicine, Silver sulfadiazine, Consciousness Energy Healing Treatment, The Trivedi Effect[®], PXRD, Particle size, DSC, TGA/DTG

Introduction

Silver sulfadiazine is a sulfonamide-based topical medicine having antibacterial and antifungal activity, act through a combined activity of silver and sulfadiazine [1]. Sodium chloride-containing body fluids interact with silver sulfadiazine, and silver ions are released slowly into wounded areas. Silver ions catalyse the formation of disulphide bonds leading to protein structural changes and inactivating thiol-containing enzymes [2]. Silver ions may also

intercalate DNA thereby interfering with replication and transcription of bacteria. Sulfadiazine inhibits bacterial dihydropteroate synthase as an inhibitor of para-aminobenzoic acid, thereby resulting in the disruption of folic acid metabolism and ultimately DNA synthesis [3,4]. Application to large areas or severe burns may lead to systemic absorption and lead to adverse effects similar to those of other sulphonamides [5]. Tentative evidence has found other antibiotics to be more effective in the healing of superficial and partial thickness burn injuries; therefore, it is no longer generally recommended [6].

Study of the physicochemical properties of a pharmaceutical product for its dissolution and absorption parameters are cru-

cial for the formulation. Therefore, in this study, special attention was taken to improve these parameters of the pharmaceutical product, e.g., silver sulfadiazine. The chemical is poorly soluble and has very limited penetration through intact skin [7]. In this scenario, it was observed that the Trivedi Effect®-Biofield Energy Healing Treatment has the considerable impact on various properties such as particle size, surface area, and other chemical and thermal behaviour of nutraceutical/ pharmaceutical [8-11]. The Trivedi Effect® is natural and scientifically proven phenomenon in which a skilled person can harness the inherently intelligent energy and transmit it anywhere on the planet through the possible mediation of neutrinos [8]. Every living organism possesses this kind of unique energy surrounding the body known as Biofield Energy, which is infinite, para-dimensional electromagnetic field. Biofield based Energy Healing Therapies have been reported to have significant outcomes against various disease conditions [12]. The National Institutes of Health (NIH) and the National Center for Complementary and Alternative Medicine (NCCAM) recommend and included the Energy therapy under Complementary and Alternative Medicine (CAM) category that has been accepted by the most of the U.S. population [13,14]. The Trivedi Effect®-Consciousness Energy Healing Treatment has been widely reported with astounding capability to alter the characteristic properties of the several non-living materials and living object(s), i.e., metals and ceramic [15,16], organic compounds [17-19], nutraceuticals/ pharmaceuticals [9-11,20,21], and crops [22,23]. The Consciousness Energy Healing Treatment has also enhanced the bioavailability of pharmaceutical/nutraceutical compounds [24-26]. Thus, this study was designed to determine the impact of the Trivedi Effect®-Consciousness Energy Healing Treatment on the physicochemical and thermal properties of silver sulfadiazine 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

The test compound silver sulfadiazine was purchased from Tokyo Chemical Industry Co., Ltd., Japan and the other chemicals like sunflower oil (Sigma-Aldrich, India) and methanol (Merck, India) were used during the experiments were purchased from India.

Consciousness Energy Healing Treatment Strategies

The test sample silver sulfadiazine was divided into two parts. One part of silver sulfadiazine was treated with the Trivedi Effect®-Consciousness Energy Healing Treatment remotely under standard laboratory conditions for 3 minutes by the renowned Biofield Energy Healer, Alice Branton, USA, and known as a Biofield Energy Treated silver sulfadiazine sample. This Biofield Energy Treatment was provided through the healer's unique energy trans-

mission process to the test sample [8,12-14]. Whereas, the other part was considered as a control sample, was treated with a "sham" healer for comparison purpose. The "sham" healer is an ordinary person who did not have any knowledge about the Biofield Energy Treatment. After that, both the samples were kept in sealed conditions and further characterized using PXRD, PSA, DSC, and TGA/DTG analytical techniques.

Characterization

The PXRD, PSA, DSC, and TGA analysis of silver sulfadiazine was performed. The PXRD analysis of silver sulfadiazine powder sample was performed with the help of Rigaku MiniFlex-II Desktop X-ray diffractometer (Japan) [27,28]. 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 [29]. The PSA was performed using Malvern Mastersizer 2000, from the UK with a detection range between 0.01 μm to 3000 μm using the wet method. Similarly, the DSC analysis of silver sulfadiazine was performed with the help of DSC Q200, TA Instruments. The TGA/DTG thermograms of silver sulfadiazine were obtained with the help of TGA Q50 TA instruments [30,31]. The % change in particle size, specific surface area (SSA), peak intensity, crystallite size, melting point, latent heat, weight loss and the maximum thermal degradation temperature (T_{max}) 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

Powder X-ray Diffraction (PXRD) Analysis

The control silver sulfadiazine showed sharp and intense peaks (Figure 1) in the PXRD diffractogram. Similar peaks were shown in the diffractogram of the Biofield Energy Treated sample too, indicated that both the samples were crystalline in nature. The PXRD diffractograms of the control and Biofield Energy Treated samples showed the highest peak intensity at 2θ equal to 10.206° and 10.277° , respectively (Table 1, entry 2). The peak intensities of the Biofield Energy Treated silver sulfadiazine were significantly decreased from -14.5% to -54.5% compared to the control sample. Similarly, the crystallite sizes of the Biofield Energy Treated silver sulfadiazine was significantly altered from -48.9% to 6.4% with respect to the control sample. Besides, the average crystallite size of the Biofield Energy Treated sample (324.38 nm) was found to be significantly decreased by 13.99% as compared to the control sample (377.15 nm).

Entry No.	Bragg angle (2θ)		Peak Intensity (%)			Crystallite size (G, nm)		
	Control	Treated	Control	Treated	% change	Control	Treated	% change
1	8.802	8.891	726	380	-47.6	347	242	-30.26
2	10.206	10.277	4266	1940	-54.5	389	298	-23.39
3	13.006	13.117	235	131	-44.2	415	393	-5.30
4	16.102	16.089	262	184	-29.7	417	376	-9.83
5	18.461	18.555	720	356	-50.5	454	469	3.30
6	19.838	19.945	402	197	-50.9	402	312	-22.39
7	21.503	21.605	271	187	-30.9	437	465	6.41
8	23.060	23.139	384	207	-46.1	421	423	0.48
9	24.257	24.393	524	367	-29.9	425	361	-15.06
10	27.90	27.950	308	204	-33.7	186	167	-10.22
11	33.150	33.240	388	210	-45.8	382	305	-20.16
12	37.170	37.420	144	123	-14.5	231	118	-48.92
13	38.412	38.569	343	183	-46.6	397	288	-27.46

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

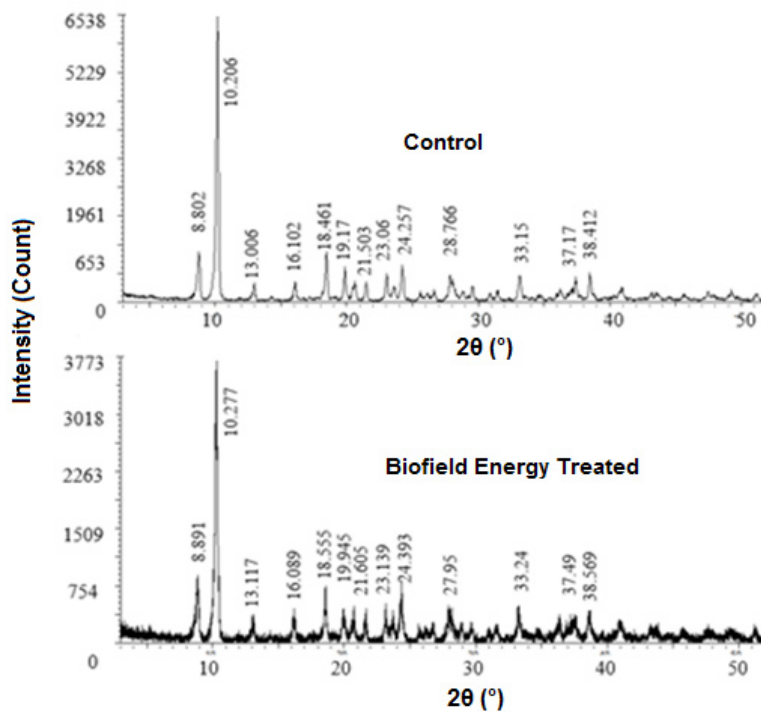


Figure 1: PXRD diffractograms of the control and Biofield Energy Treated silver sulfadiazine.

The alterations in peak intensities and the crystallite sizes indicate the altered morphology of the Biofield Energy Treated silver sulfadiazine crystal compared to the control sample. The peak intensity of each diffraction face on the crystalline compound changes according to the crystal morphology [32] and alterations in the PXRD pattern provide the proof of polymorphic transitions [33,34]. Different polymorphic forms of pharmaceuticals have the significant effects on the drug performance, such as bioavailability, therapeutic efficacy, and toxicity, because of their thermodynamic and physicochemical properties like crystallization, energy, stability, and especially solubility, are different from the control one [35,36]. Thus, it can be anticipated that the treated silver sulfadiazine would be better in designing pharmaceutical formulations containing silver sulfadiazine.

Particle Size Analysis (PSA)

The particle size distribution analysis of both the control and Biofield Energy Treated silver sulfadiazine was performed, and the

comparison of distributions is presented in Table 2. The particle size values of the control silver sulfadiazine at d_{10} , d_{50} , d_{90} , and $D(4,3)$ were 7.653 μm , 30.862 μm , 92.370 μm , and 42.513 μm , respectively. Similarly, the particle sizes of the Biofield Energy Treated silver sulfadiazine at d_{10} , d_{50} , d_{90} , and $D(4,3)$ were 7.145 μm , 30.440 μm , 91.860 μm , and 41.474 μm , respectively. Therefore, the particle size values in Alice's Biofield Energy Treated silver sulfadiazine were decreased at d_{10} , d_{50} , d_{90} , and $D(4,3)$ by 6.64%, 1.37%, 0.55%, and 2.44%, respectively compared to the control sample. The specific surface area of Biofield Energy Treated silver sulfadiazine (0.594 m^2/g) was increased significantly by 11.23% compared with the control sample (0.534 m^2/g). Hence, it can be assumed that the Trivedi Effect[®]-Consciousness Energy Healing Treatment might act as an external force for reducing the particle size of silver sulfadiazine, thus increased the SSA [8,37]. So, the treated silver sulfadiazine might offer better bioavailability compared with the untreated sample.

Parameter	d_{10} (μm)	d_{50} (μm)	d_{90} (μm)	$D(4,3)$ (μm)	SSA(m^2/g)
Control	7.653	30.862	92.370	42.513	0.534
Biofield Treated	7.145	30.440	91.860	41.474	0.594
Percent change (%)	-6.64	-1.37	-0.55	-2.44	11.23

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.

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

Differential Scanning Calorimetry (DSC) Analysis

DSC analysis has been performed to characterize the thermal behavior of both, the control and Biofield Energy Treated silver sulfadiazine (Table 3 and Figure 2). The DSC thermograms of the control and Biofield Energy Treated silver sulfadiazine showed the sharp endothermic peak at 262.58°C and 262.05°C, respectively (Figure 2). The melting point of the Biofield Energy Treated silver sulfadiazine was slightly decreased by 0.20% compared with the control sample (Table 3).

Sample	Melting point (°C)	$\Delta H(\text{J/g})$	Decomposition temperature	$\Delta H(\text{J/g})$
Control Sample	262.58	53.02	280.43	7.954
Biofield Energy Treated	262.05	52.79	279.80	7.866
% Change	-0.20	-0.43	-0.22	-1.11

ΔH : Latent heat of fusion/decomposition.

Table 3: DSC data for both control and Biofield Energy Treated samples of silver sulfadiazine.

The latent heat of fusion (ΔH_{fusion}) of the Biofield Energy Treated silver sulfadiazine (52.79 J/g) was slightly decreased by 0.43% compared with the control sample (53.02 J/g) (Table 3). One exothermic peak also observed in both the control and Biofield treated silver sulfadiazine in the DSC thermogram. The decomposition temperature and the corresponding $\Delta H_{\text{decomposition}}$

of the treated sample were observed to be decreased by 0.22% and 1.11%, respectively, which can be attributed to the disrupted molecule chains in the crystal structure [37]. Thus, it can be assumed that Alice's Biofield Energy Treatment might be responsible for the disruption the molecular chains and crystal structure of silver sulfadiazine which was the cause of decreased melting point of the

treated sample compared with the control sample.

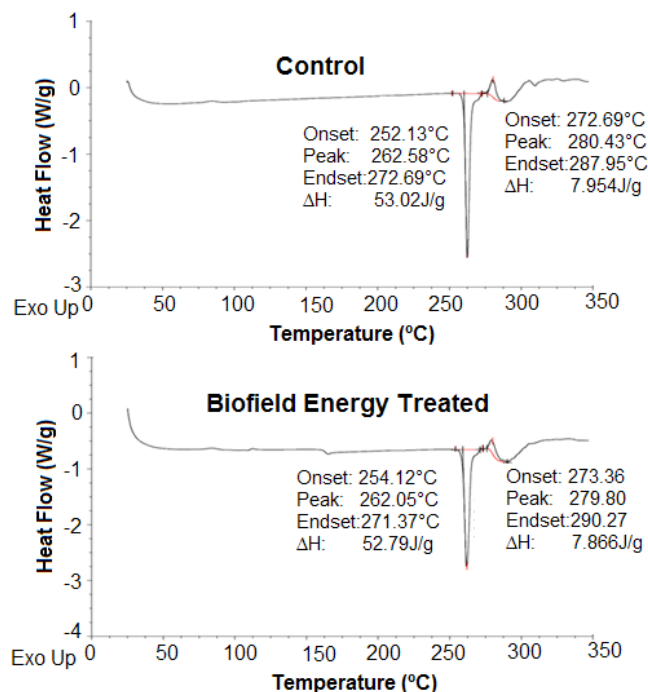


Figure 2: DSC thermograms of the control and Biofield Energy Treated silver sulfadiazine.

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

The TGA thermograms of the control and Biofield Energy Treated samples displayed one step of thermal degradation (Figure 3). The total weight loss in the Biofield Energy Treated silver sulfadiazine was increased by 10.73% compared with the control sample (Table 4). Therefore, the residue amount was decreased by 16.49% in the Biofield Energy Treated silver sulfadiazine compared to the control sample (Table 4).

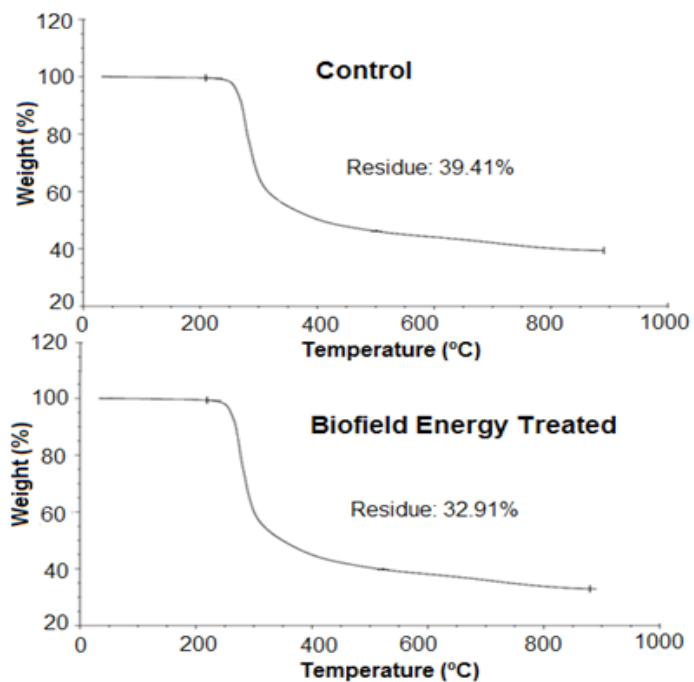


Figure 3: TGA thermograms of the control and Biofield Energy Treated silver sulfadiazine.

Sample	TGA		DTG
	Total weight loss (%)	Residue %	T _{max} (°C)
Control	60.59	39.41	276.30
Biofield Energy Treated	67.09	32.91	274.63
% Change	10.73	-16.49	-0.60

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

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

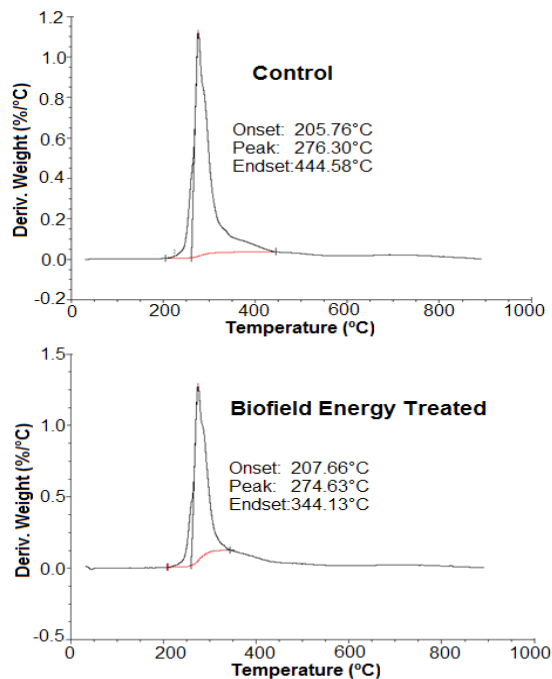


Figure 4: DTG thermograms of the control and Biofield Energy Treated silver sulfadiazine.

The DTG thermograms of the control and Biofield Energy Treated silver sulfadiazine exhibited only one peak (Figure 4). The control silver sulfadiazine was thermally stable up to 276.30°C, while Biofield Energy Treated silver sulfadiazine was stable up to 274.63°C. The T_{max} of the Biofield Energy Treated sample was significantly decreased by 0.60% compared with the control sample (Table 4). Overall, TGA/DTG revealed that the thermal stability of the Biofield Energy Treated silver sulfadiazine was significantly decreased compared with the control sample.

Conclusions

The Trivedi Effect[®]-Consciousness Energy Healing Treatment showed significant effects on the crystal morphology, particle size distribution, and thermal properties of silver sulfadiazine. The PXRD analysis exhibited that the peak intensities of Alice's Biofield Energy Treated silver sulfadiazine were decreased from 14.5% to 54.5% compared with the control sample. Similarly, the crystallite sizes of the Biofield Energy Treated sample were significantly altered from -48.9% to 6.4% compared to the control sample. Also, the average crystallite size of the Biofield Energy Treated sample was found to be decreased by 13.99% as compared to the control sample. The particle size values of the Biofield Energy Treated silver sulfadiazine were decreased significantly by 6.64% at d_{10} followed by d_{50} (-1.37%), d_{90} (-0.55%) and D (4,3)

(-2.44%) compared to the control sample. The specific surface area of the Biofield Energy Treated silver sulfadiazine was increased significantly by 11.23% compared to the control sample. The total weight loss was increased by 10.73% in TGA; however, the residue amount was decreased by 16.49% in the Biofield Energy Treated silver sulfadiazine compared with the control sample. The T_{max} of the Biofield Energy Treated sample was significantly decreased by 0.60% compared with the control sample. Thus, the Trivedi Effect[®]-Consciousness Energy Healing Treatment might lead to generate a new polymorphic form of silver sulfadiazine which would be more soluble and bioavailable compared to the untreated sample. The Trivedi Effect Treated silver sulfadiazine would be more useful to design better pharmaceutical formulations that might offer better therapeutic response against bacterial infections, superficial and partial thickness burn injuries.

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