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# Use of Energy Healing Medicine Against *Escherichia coli* for Antimicrobial Susceptibility, Biochemical Reaction and Biotyping

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**Abstract:** *Escherichia coli* (*E. coli*) infections are the major health concern, as it causes infections in human mainly in urinary tract, ear, and wound infections. The present study evaluates the impact of biofield energy treatment on *E. coli* regarding antimicrobial sensitivity assay, biochemical study and biotype number. Four multidrug resistant (MDR) clinical lab isolates (LSs) of *E. coli* (LS 12, LS 13, LS 42, and LS 51) were taken in two groups *i.e.* control and treated. After treatment, above mentioned parameter were evaluated on day 10 in control and treated samples using MicroScan Walk-Away® system. The antimicrobial sensitivity assay was reported with 46.67% alteration (14 out of 30 tested antimicrobials) in treated group of MDR *E. coli* isolates. The minimum inhibitory concentration (MIC) study showed the alteration in MIC values of about 34.37% (11 out of 32) tested antimicrobials, after biofield treatment in clinical isolates of *E. coli*. Piperacillin/tazobactam was reported with improved sensitivity and four-fold decrease in the MIC value (64 to ≤16 µg/mL) in LS 42, as compared with the control. Amoxicillin/k-clavulanate reported with improved sensitivity pattern from resistance to susceptible, with two-fold decrease in MIC value (>16/8 to ≤8/4 µg/mL) in biofield treated LS 51. Further, biochemical study showed 24.24% alteration (8 out of 33) in tested biochemical reactions after treatment among four isolates of *E. coli* as compared to the control. A change in biotype number (7774 4272) was reported as compared to the control, (7311 4012), with new organism identified as *Klebsiella pneumoniae* in biofield treated LS 13 with respect to the control organism, *E. coli*. Overall, data suggested that Mr. Trivedi's biofield energy treatment can be applied to alter the antimicrobial sensitivity, biochemical reactions and biotype number of *E. coli.*

**Keywords:** *Escherichia coli*, Biofield Energy Treatment, Multidrug-Resistant, Antibiogram, Biochemical, Biotyping

## 1. Introduction

*Escherichia coli* (*E. coli*) is a Gram-negative, rod shape, and facultative anaerobic pathogen linked with community-associated as well as nosocomial infections. It is commensal in nature, and predominantly found in human colonic flora, which might result in fatal enteric infections [1]. Although, enteric *E. coli* can be categories based on its virulence nature, such as enteroinvasive *E. coli* (EIEC), enteropathogenic *E. coli* (EPEC), enterotoxigenic *E. coli* (ETEC), enterohemorrageic *E. coli* (EHEC), verotoxigenic *E. coli* (VTEC), and enteroadherent aggregative *E. coli* (EAggEC) [2]. However, most of the strains resides in our large intestine and are not harmful, as they help to breakdown the food and assist in the production of vitamin K, waste processing, and food absorption. But, pathogenic isolates of *E. coli* are responsible for infections such as diarrhea, urinary tract infections (UTIs), extra intestinal infections, meningitis, and septicemia [3]. Besides intestinal infections, *E. coli* is one of the major infectious Gram-negative pathogens after group B Streptococcus [4]. The increase emergence of multidrug-resistant (MDR) isolates of *E. coli* against broad-spectrum antimicrobial agents [5], are the main cause of failure of drug therapies, which leads to high rate of morbidity and mortality [6]. Due to a continuous increase in drug resistance against antibiotics, the alternative therapeutic regimens are now preferred such as cranberry juice in UTI infections caused by

*E. coli* [7]. Recently, energy healing therapies under the complementary and alternate medicine (CAM) have been reported with several beneficial effects. Biofield energy treatment is one of the approaches used on pathogenic microorganisms and reported to alter the sensitivity pattern of antimicrobials [8].

Alternative medicine remains alternative due to their serious challenges against mainstream biomedical paradigm, as it requires a new framework. Alternative medicines that implicate subtle or very low intensity stimuli/energy are commonly known as energy medicine. Major energy medicines are healer interventions, homeopathy, electromagnetic (EM) therapies, and acupuncture. Energy medicines have been categorized in CAM therapies, by National Center for Complementary and Alternative Medicine (NCCAM) [9]. The lack of acceptance of biofield treatment is not surprising, however, various explanations and proposed mechanisms are offered in term of vital force or life energy. According to the conventional physical theory, consciousness is one of the possible mechanisms, in which healer's intent to heal and interact with the physical realm of patient [10]. Another theory includes subtle energies (physical resonance), which might exchange or involve between the energy fields of healer and patient [11]. In spite of the knowledge of actual mechanism behind non-invasive energy medicine, peoples are getting continuous benefits in cancer, arthritis, anxiety and many more [12-14]. The energy exists in various forms such as potential, electrical, kinetic, magnetic, and nuclear energy that can be produced from different sources. The subtle energy fields that purportedly surround and penetrate the human body are collectively defined as biofield and the extent of energy associated with biofield is termed as biofield energy. Mr. Mahendra Kumar Trivedi has the unique biofield energy, which has the ability to alter the characteristics of living and non-living things. Mr. Trivedi's unique biofield treatment is also termed as The Trivedi Effect®, which has been studied in the field of agricultural science research [15], biotechnology [16], and microbiology research [17, 18].

Due to the clinical significance of *E. coli*, present work was designed to study the impact of biofield energy treatment on MDR isolates of *E. coli* with respect to its antimicrobials susceptibility, biochemical reactions pattern, and biotype number.

# 2. Materials and Methods

### *2.1. Study Design and Biofield Energy Treatment*

The MDR clinical lab isolates of *E. coli* (*i.e.* LS 12, LS 13, LS 42 and LS 51) were obtained from the stored stock cultures in microbiology lab, Hinduja hospital, Mumbai. Each MDR isolate was divided into two groups *i.e.* control and treated. Mr. Trivedi provided the biofield treatment to the treated group through his energy transmission process under laboratory conditions, which includes bioenergy emission without touching the samples. The biofield treated samples were returned in the similar sealed condition and further analyzed on day 10 using the standard protocols. The parameters studied after treatment were antimicrobial susceptibility, minimum inhibitory concentration (MIC), biochemical reactions, and biotype number in all four control and treated samples of MDR *E. coli* isolates using MicroScan Walk-Away® (Dade Behring Inc., USA). All antimicrobials and biochemicals were procured from Sigma Aldrich, MA, USA.

### *2.2. Assessment of Antimicrobial Susceptibility Assay*

Antimicrobial susceptibility pattern of control and treated MDR clinical lab isolates of *E. coli* of were evaluated with the help of MicroScan Walk-Away® using Negative Break Point Combo (NBPC 30) panel according to the clinical and laboratory standards institute (CLSI) guidelines. The test was carried out on MicroScan, which have been dehydrated for broth dilution susceptibility assay. Briefly, the standardized cell suspension of *E. coli* were inoculated followed by rehydration, and were incubated for 16 hours at 35°C. Further, experimental procedures and suggested conditions were followed according to the manufacturer's instructions. The antimicrobial susceptibility pattern (S: Susceptible, I: Intermediate, R: Resistant, and EBL: Suspected extended-spectrum β-lactamases) and MIC values of antimicrobials were observed as the lowest antimicrobial concentration which shows growth inhibition [19].

### *2.3. Identification by Biochemical Study and Biotype Number*

The biochemical reactions study using set of standard biochemicals were performed using photometric or fluorogenic reader. On the basis of nature of bacilli (*i.e.* Gram-negative), computerized reports were generated using conventional panels, which utilizes the photometric reader. Before commencing the experiment, the NBPC 30 panel was first incubated and read on the MicroScan Walkaway system. Further, the panel was removed from system and recorded on the Biomic system within 1 hour. The instrument consists of a database associated with collective information, which was required to identify the microbes with respect to group, genera, or species of the family. The biotype number of each MDR isolates in control and treated samples of *E. coli* were evaluated along with identification of microorganism using MicroScan Walk-Away® processed panel data. The detailed experimental procedure was followed as per manufacturer-recommended instructions [19].

# 3. Results and Discussion

### *3.1. Antimicrobial Susceptibility Assay*

Antimicrobial sensitivity test was carried out using thirty antimicrobials, and the sensitivity pattern of biofield treated MDR isolates of *E. coli* was compared with respect to the control.

Results of antimicrobial sensitivity pattern of control and treated MDR isolates of *E. coli* are summarized in Table 1.

Overall, 14 out of 30 tested antimicrobials (46.67%) were reported with alteration in sensitivity pattern after biofield treatment as compared with their respective control. An improved sensitivity was reported in case of amoxicillin/k-clavulanate *i.e.* from resistance (R) to susceptible (S) in biofield treated LS 51 isolate. MDR isolates after biofield treatment were reported with change in sensitivity pattern against amikacin (I to S) in LS 42, ampicillin/sulbactam (S to R) in LS 13, aztreonam, ceftriaxone and cefotaxime (EBL to R) in LS 12, ceftazidime (EBL to I) in LS 12, cefepime (I to R) in LS 13 and 51, and chloramphenicol (S to I) in LS 12 and 13. Further, altered sensitivity of amoxicillin/k-clavulanate was reported as S to IB and I to R in LS 12 and LS 42, respectively. However, cefotetan sensitivity was altered from S to IB in LS 12, and S to R in LS 42, while cefoxitin sensitivity was altered from S to R in LS 13, and S to I in LS 51. Similarly, ticarcillin/k-clavulanate was reported with changes of sensitivity pattern as S to IB in LS 12, and S to I in LS 13 and LS 51 after biofield treatment. Gentamicin sensitivity was reported as S to R in biofield treated LS 13. Slightly improved sensitivity was reported in piperacillin/tazobactam *i.e.* I to S in LS 42, while altered sensitivity was reported as S to IB in LS 12 after biofield treatment.

MIC study showed an alterations in 34.38% (11 out of 32) tested antimicrobials as compared with the control. A maximum of four-fold decrease in MIC value was reported in piperacillin/tazobactam (64 to ≤16 µg/mL) in LS 42, while two-fold decrease of MIC values were reported in amikacin (32 to ≤16 µg/mL) in LS 42, and amoxicillin/k-clavulanate (>16/8 to ≤8/4 µg/mL) in LS 51. Further, a slight decrease in MIC value of ceftazidime (>16 to 16 µg/mL) was reported after biofield treatment as compared with control in LS 12. However, a slight change in MIC value was also reported in the case of amoxicillin/k-clavulanate (in LS 42) and cefepime (in LS 13 and LS 51) with respect to the respective control values. Besides, decreased in MIC values in some antimicrobials, two-fold alteration was also reported in case of cefotetan (≤16 to >32 µg/mL, in LS 42), cefoxitin (≤8 to >16 µg/mL, in LS 13, and ≤8 to 16 µg/mL in LS 51), chloramphenicol (≤8 to 16 µg/mL, in LS 12 and 13), ampicillin/sulbactam (≤8/4 to >16/8 µg/mL in LS 13), and gentamicin (≤4 to >8 µg/mL, in LS 13). Ticarcillin/k-clavulanate was also reported with four-fold alteration in MIC value as ≤16 µg/mL in control while 64 µg/mL in biofield treated LS 13 and LS 51. The rest of the tested antimicrobials were reported with no change in MIC values as compared with their respective control (Table 2).

***Table 1.*** *Effect of biofield treatment on multidrug resistant lab isolates of Escherichia coli for its antimicrobial susceptibility pattern.*

| S. No. | Antimicrobial | LS 12 | | LS 13 | | LS 42 | | LS 51 | |
|---|---|---|---|---|---|---|---|---|---|
| | | C | T | C | T | C | T | C | T |
| 1 | Amikacin | S | S | S | S | I | S | S | S |
| 2 | Amoxicillin/k-clavulanate | S | IB | S | S | I | R | R | S |
| 3 | Ampicillin/sulbactam | I | I | S | R | R | R | R | R |
| 4 | Ampicillin | R | R | R | R | R | R | R | R |
| 5 | Aztreonam | EBL | R | EBL | EBL | EBL | EBL | EBL | EBL |
| 6 | Cefazolin | R | R | R | R | R | R | R | R |
| 7 | Cefepime | R | R | I | R | R | R | I | R |
| 8 | Cefotaxime | EBL | R | EBL | EBL | EBL | EBL | EBL | EBL |
| 9 | Cefotetan | S | IB | S | S | S | R | S | S |
| 10 | Cefoxitin | I | I | S | R | R | R | S | I |
| 11 | Ceftazidime | EBL | I | EBL | EBL | EBL | EBL | EBL | EBL |
| 12 | Ceftriaxone | EBL | R | EBL | EBL | EBL | EBL | EBL | EBL |
| 13 | Cefuroxime | R | R | R | R | R | R | R | R |
| 14 | Cephalothin | R | R | R | R | R | R | R | R |
| 15 | Chloramphenicol | S | I | S | I | S | S | S | S |
| 16 | Ciprofloxacin | R | R | R | R | R | R | R | R |
| 17 | ESBL-a Scrn | EBL | - | EBL | EBL | EBL | EBL | EBL | EBL |
| 18 | ESBL-b Scrn | EBL | - | EBL | EBL | EBL | EBL | EBL | EBL |
| 19 | Gatifloxacin | R | R | R | R | R | R | R | R |
| 20 | Gentamicin | R | R | S | R | R | R | R | R |
| 21 | Imipenem | S | S | S | S | S | S | S | S |
| 22 | Levofloxacin | R | R | R | R | R | R | R | R |
| 23 | Meropenem | S | S | S | S | S | S | S | S |
| 24 | Moxifloxacin | R | R | R | R | R | R | R | R |
| 25 | Piperacillin/tazobactam | S | IB | S | S | I | S | S | S |
| 26 | Piperacillin | R | R | R | R | R | R | R | R |
| 27 | Tetracycline | R | R | R | R | R | R | R | R |
| 28 | Ticarcillin/k-clavulanate | S | IB | S | I | R | R | S | I |
| 29 | Tobramycin | R | R | R | R | R | R | I | I |
| 30 | Trimethoprim/sulfamethoxazole | R | R | R | R | R | R | R | R |

C: Control; T: Treatment; LS: Clinical lab isolate; ESBL: Extended spectrum β-lactamases a,b Screen; EBL: Suspected extended-spectrum β-lactamases; -: Not reported

*E. coli* was responsible for mixed infections and had been reported with increased resistance against antibiotics. Ceftazidime and amikacin were the only effective and preferred antibiotics in mixed infections. Clinical isolates selected for this study were reported with very high resistance against tested antimicrobials like ampicillin, cefotaxime, ceftriaxone, ceftazidime, tetracycline, tobramycin, and aztreonam. The members of *Enterobacteriaceae* family mainly produce different enzymes like β-lactamases that are generally responsible for resistance pattern. However, β-lactamases can hydrolyze the extended spectrum cephalosporin, such as ceftriaxone, cefotaxime, ceftazidime etc. [20]. Extended spectrum β-lactamases (ESBLs) are reported for resistance against non-penicillin antibiotics along with β-lactam antibiotics [21].

Results showed the alteration in antimicrobial sensitivity and MIC values of tested antimicrobials after biofield treatment in clinical isolates of *E. coli.* Aztreonam, cefotaxime, and ceftriaxone showed altered sensitivity after biofield treatment *i.e.* from EBL to R, in LS 12. Results suggest that biofield energy treatment might induce the β-lactamase production, which depicts the resistance pattern of aztreonam, cefotaxime, and ceftriaxone as compared with the control. However, enzyme production depends upon the strain, and generally produced during the exposure to antibiotics. It was reported that quantity of β-lactamase enzymes will depends upon the exposure time and concentration of antibiotics [20].

Amikacin will be the preferred aminoglycosides for the treatment of childhood *E. coli* infection in lower UTIs [22]. Biofield energy treatment on LS 42 isolate was reported with an improved sensitivity and decreased MIC value of amikacin by two-fold as compared with the control. The resistance in aminoglycosides was mainly reported due to the production of three types of aminoglycoside modifying enzymes *viz.* AAC (N-Acetyltransferases), which catalyzes acetyl CoA-dependent acetylation of an amino group; ANT (O-Adenyltransferases), which catalyzes ATP-dependent adenylation of hydroxyl group; and APH (O-Phosphotransferases), which catalyzes ATP-dependent phosphorylation of a hydroxyl group [23].

***Table 2.*** *Minimum inhibitory concentration (MIC) of tested antimicrobials against multidrug resistant clinical lab isolates of Escherichia coli.*

| S. No. | Antimicrobial | LS 12 | | LS 13 | | LS 42 | | LS 51 | |
|---|---|---|---|---|---|---|---|---|---|
| | | C | T | C | T | C | T | C | T |
| 1 | Amikacin | ≤16 | ≤16 | ≤16 | ≤16 | 32 | ≤16 | ≤16 | ≤16 |
| 2 | Amoxicillin/k-clavulanate | ≤8/4 | ≤8/4 | ≤8/4 | ≤8/4 | 16/8 | >16/8 | >16/8 | ≤8/4 |
| 3 | Ampicillin/sulbactam | 16/8 | 16/8 | ≤8/4 | >16/8 | >16/8 | >16/8 | >16/8 | >16/8 |
| 4 | Ampicillin | >16 | >16 | >16 | >16 | >16 | >16 | >16 | >16 |
| 5 | Aztreonam | >16 | >16 | >16 | >16 | >16 | >16 | >16 | >16 |
| 6 | Cefazolin | >16 | >16 | >16 | >16 | >16 | >16 | >16 | >16 |
| 7 | Cefepime | >16 | >16 | 16 | >16 | >16 | >16 | 16 | >16 |
| 8 | Cefotaxime | >32 | >32 | >32 | >32 | >32 | >32 | >32 | >32 |
| 9 | Cefotetan | ≤16 | ≤16 | ≤16 | ≤16 | ≤16 | >32 | ≤16 | ≤16 |
| 10 | Cefoxitin | 16 | 16 | ≤8 | >16 | >16 | >16 | ≤8 | 16 |
| 11 | Ceftazidime | >16 | 16 | >16 | >16 | >16 | >16 | >16 | >16 |
| 12 | Ceftriaxone | >32 | >32 | >32 | >32 | >32 | >32 | >32 | >32 |
| 13 | Cefuroxime | >16 | >16 | >16 | >16 | >16 | >16 | >16 | >16 |
| 14 | Cephalothin | >16 | >16 | >16 | >16 | >16 | >16 | >16 | >16 |
| 15 | Chloramphenicol | ≤8 | 16 | ≤8 | 16 | ≤8 | ≤8 | ≤8 | ≤8 |
| 16 | Ciprofloxacin | >2 | >2 | >2 | >2 | >2 | >2 | >2 | >2 |
| 17 | ESBL-a Scrn | >4 | >4 | >4 | >4 | >4 | >4 | >4 | >4 |
| 18 | ESBL-b Scrn | >1 | >1 | >1 | >1 | >1 | >1 | >1 | >1 |
| 19 | Gatifloxacin | >4 | >4 | >4 | >4 | >4 | >4 | >4 | >4 |
| 20 | Gentamicin | >8 | >8 | ≤4 | >8 | >8 | >8 | >8 | >8 |
| 21 | Imipenem | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 |
| 22 | Levofloxacin | >4 | >4 | >4 | >4 | >4 | >4 | >4 | >4 |
| 23 | Meropenem | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 | ≤4 |
| 24 | Moxifloxacin | >4 | >4 | >4 | >4 | >4 | >4 | >4 | >4 |
| 25 | Nitrofurantoin | ≤32 | ≤32 | ≤32 | ≤32 | ≤32 | ≤32 | >64 | >64 |
| 26 | Norfloxacin | >8 | >8 | >8 | >8 | >8 | >8 | >8 | >8 |
| 27 | Piperacillin/tazobactam | ≤16 | ≤16 | ≤16 | ≤16 | 64 | ≤16 | ≤16 | ≤16 |
| 28 | Piperacillin | >64 | >64 | >64 | >64 | >64 | >64 | >64 | >64 |
| 29 | Tetracycline | >8 | >8 | >8 | >8 | >8 | >8 | >8 | >8 |
| 30 | Ticarcillin/k-clavulanate | ≤16 | ≤16 | ≤16 | 64 | >64 | >64 | ≤16 | 64 |
| 31 | Tobramycin | >8 | >8 | >8 | >8 | >8 | >8 | 8 | 8 |
| 32 | Trimethoprim/sulfamethoxazole | >2/38 | >2/38 | >2/38 | >2/38 | >2/38 | >2/38 | >2/38 | >2/38 |

MIC values are presented in μg/mL; C: Control; T: Treatment; LS: Clinical lab isolate; ESBL: Extended spectrum β-lactamases a,b Screen

Antimicrobial resistance can be a result of horizontal gene transfer, and might have unlinked point mutations of pathogenic genome [24], biofield treatment might alter the gene transfer that could lead to alter the sensitivity pattern of tested antimicrobials. Due to increased antimicrobial resistance, fluoroquinolones antimicrobial are another preferred drug to treat community and hospital acquired infections [25]. Besides fluoroquinolones, carbapenems are also effectively used against ESBL producing *E. coli*. Retamar *et al.* reported the use of piperacillin/tazobactam in bacteremia patients [26], and conclude that carbapenems are still the best drug of choice to treat infections of ESBL producing *Enterobacteriaceae* [26]. Biofield energy treatment on LS 42, reported for an improved sensitivity and decreased MIC value in piperacillin/tazobactam by four-fold as compared to the control.

***Table 3.*** *Effect of biofield treatment on multidrug resistant lab isolates of Escherichia coli to the vital processes occurring in living organisms.*

| S. No. | Code | Biochemical | LS 12 | | LS 13 | | LS 42 | | LS 51 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | T | C | T | C | T | C | T |
| 1 | ACE | Acetamide | - | - | - | - | - | - | - | - |
| 2 | ADO | Adonitol | - | - | - | + | - | - | - | - |
| 3 | ARA | Arabinose | + | + | + | + | + | + | + | + |
| 4 | ARG | Arginine | - | - | - | - | - | - | - | - |
| 5 | CET | Cetrimide | - | - | - | - | - | - | - | - |
| 6 | CF8 | Cephalothin | + | + | + | + | + | + | + | + |
| 7 | CIT | Citrate | - | - | - | + | - | - | - | - |
| 8 | CL4 | Colistin | - | - | - | - | - | - | - | - |
| 9 | ESC | Esculin hydrolysis | - | - | - | + | - | - | - | - |
| 10 | FD64 | Nitrofurantoin | - | - | - | - | - | - | + | + |
| 11 | GLU | Glucose | + | + | + | + | + | + | + | + |
| 12 | H2S | Hydrogen sulfide | - | - | - | - | - | - | - | - |
| 13 | IND | Indole | + | + | + | - | + | + | + | + |
| 14 | INO | Inositol | - | - | - | + | - | - | - | - |
| 15 | K4 | Kanamycin | + | + | + | + | + | + | + | + |
| 16 | LYS | Lysine | - | - | + | + | + | + | + | + |
| 17 | MAL | Malonate | - | - | - | + | - | - | - | - |
| 18 | MEL | Melibiose | + | + | + | + | + | + | + | + |
| 19 | NIT | Nitrate | + | + | + | + | + | + | + | + |
| 20 | OF/G | Oxidation-Fermentation | + | + | + | + | + | + | + | + |
| 21 | ONPG | Galactosidase | + | + | + | + | + | + | + | + |
| 22 | ORN | Ornithine | + | + | - | - | + | + | + | + |
| 23 | OXI | Oxidase | - | - | - | - | - | - | - | - |
| 24 | P4 | Penicillin | + | + | + | + | + | + | + | + |
| 25 | RAF | Raffinose | + | + | - | + | + | + | + | + |
| 26 | RHA | Rhamnose | + | + | + | + | + | + | + | + |
| 27 | SOR | Sorbitol | + | + | + | + | + | + | + | + |
| 28 | SUC | Sucrose | + | + | + | + | + | + | - | - |
| 29 | TAR | Tartrate | - | - | - | - | - | - | - | - |
| 30 | TDA | Tryptophan Deaminase | - | - | - | - | - | - | - | - |
| 31 | TO4 | Tobramycin | + | + | + | + | + | + | + | + |
| 32 | URE | Urea | - | - | - | + | - | - | - | - |
| 33 | VP | Voges-Proskauer | - | - | - | - | - | - | - | - |

C: Control; T: Treatment; LS: Clinical lab isolate; -: Negative; +: Positive

### *3.2. Biochemical and Biotype Number Study*

Standard biochemical tests were performed to analyze the change in biochemical reaction pattern among four MDR isolates after biofield treatment. Results of biochemical patterns of control and treated isolates are summarized in Table 3. Overall biochemical reactions showed 24.24% alterations (8 out of 33) in tested biochemicals with respect to its control. Adonitol, citrate, esculin hydrolysis, inositol, malonate, raffinose, and urea showed (-) negative to (+) positive reactions, while indole showed (+) positive to (-) negative reaction in LS 13 as compared to the control. The basic characteristic of biochemical reaction in *E. coli* strain are the positive reaction in case of indole, nitrate, glucose, and lactose, while negative biochemical reaction in case of Voges-Proskauer, and urea. The biochemical reactions of experimental control group are well supported with the literature [27]. The rest of biochemicals did not show any alteration in their reaction after biofield treatment.

Biotype numbers in control and treated groups were observed using MicroScan Walk-Away® system, which depends on the specific biochemical reactions, and will

report the possibility of organism on the basis of its biotype number. Out of the four tested clinical MDR isolates, three isolates (LS 12, LS 42, and LS 51) did not show any change in biotype number after biofield treatment. LS 13 was reported with altered biotype number as 7774 4272 as compared with its control, (7311 4012), while identified new organism was reported as *Klebsiella pneumoniae* after biofield treatment on day 10 with respect to control organism, *E. coli* (Table 4). Biofield treatment on pathogenic microorganisms had been reported with altered biotype number on the basis of biochemical reactions pattern [16].

***Table 4.*** *Effect of biofield treatment on multidrug resistant lab isolates of Escherichia coli to distinguishing feature of the genotype.*

| Isolate | Group | Biotype Number | Organism Identification |
|---|---|---|---|
| LS 12 | C | 7711 1012 | *E. coli* |
| | T | 7711 1012 | *E. coli* |
| LS 13 | C | 7311 4012 | *E. coli* |
| | T | 7774 4272 | *Klebsiella pneumoniae* |
| LS 42 | C | 7711 5012 | *E. coli* |
| | T | 7711 5012 | *E. coli* |
| LS 51 | C | 5711 5012 | *E. coli* |
| | T | 5711 5012 | *E. coli* |

C: Control; T: Treatment; LS: Clinical lab isolate

Energy medicine modalities are reported with countless number of benefits among patients after the therapy [28]. Earlier, researchers have reported the effect of energy healing influencing the *in-vitro* growth of bacteria cultures [29], effect on *in vitro* cells, tissues [30], shows the clinical effects such as hematologic [31], immunologic effects [32], and healing rates of wounds [33]. Mr. Trivedi's biofield treatment (The Trivedi Effect®) in pathogenic microbe was extensively studied and reported with a significant alteration in the antimicrobial sensitivity pattern along with molecular studies [16]. Results concluded that, biofield treatment might be an alternative approach to alter the antimicrobial sensitivity. However, the mechanism by which biofield treatment act need to be explored in future research work.

# 4. Conclusions

Increasing resistance in *E. coli* generates MDR strains, which complicate the therapeutic drug management of infections. Mr. Trivedi's biofield energy treatment on MDR isolates of *E. coli* would be a better alternative approach to change the susceptibility pattern of antimicrobials. Results indicated the alteration in antimicrobial susceptibility pattern (46.67%), MIC values (34.38%), biochemical reactions (24.24%), and biotype number. A four-fold change in MIC values was found in piperacillin/tazobactam and ticarcillin/k-clavulanate, while two-fold alteration in amikacin, amoxicillin / k-clavulanate, cefotetan, cefoxitin, chloramphenicol, and gentamicin after biofield treatment in MDR isolates. Based on the study outcome, Mr. Trivedi's biofield energy treatment as an integrative medicine approach can be applied to alter the sensitivity pattern of multi-drug resistance isolates of *E. coli* against various antimicrobials.

# Abbreviations

CAM: Complementary and alternative medicine
CLSI: Clinical and laboratory standards institute
EBL: Suspected extended-spectrum β-lactamases
ESBLs: Extended spectrum β-lactamases
MDR: Multidrug-resistant
MIC: Minimum inhibitory concentration
NBPC 30: Negative breakpoint combo 30
NCCAM: National center for complementary and alternative medicine
UTI: Urinary tract infection

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