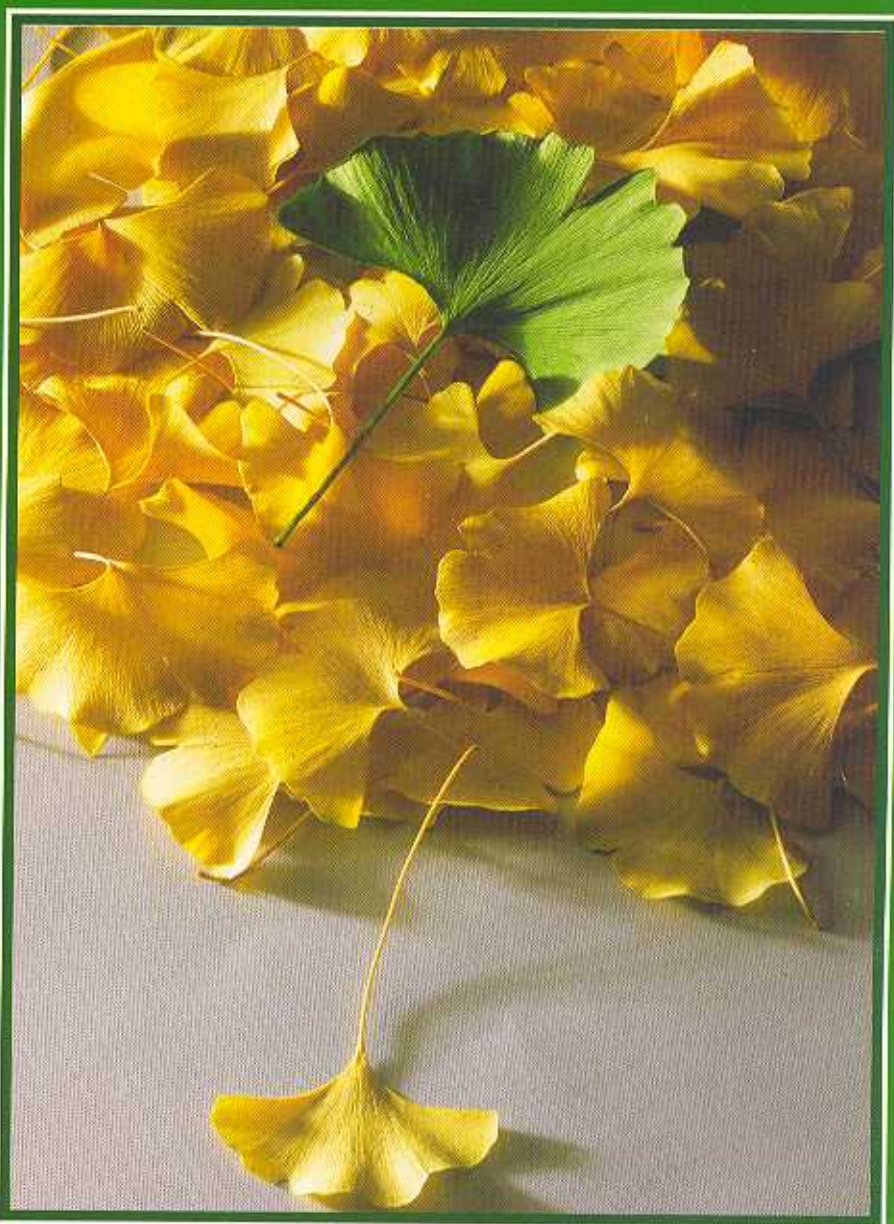


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Alternative Complementary Therapies

The Official Journal of the Society of Integrative Medicine



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cranial blood flow and
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- 55 **News You Can Use**
- 59 **Op-Ed: Should Ephedrine Be Banned in Weight-Loss Products?**
Shari Lieberman, Ph.D., C.N.S., F.A.C.N.
- 67 **Alzheimer's Disease: Part 2—A Botanical Treatment Plan**
Kathy Abascal, B.S., J.D., Herbalist, and Eric Yarnell, N.D., R.H.
- 73 **Optimizing Female Fertility**
Chris Meletis N.D., and Jason Barker, N.D.
- 78 **Expanding Clinical Applications of Hyperbaric Oxygen Therapy**
Sala Horowitz, Ph.D.
- 84 **Motor Imagery for Stroke Rehabilitation: Current Research as a Guide to Clinical Practice**
Glenna Batson, P.T., M.A.
- 90 **Bringing Sufi Rapid Healing Methods into the Laboratory: An Interview with Howard R. Hall, Ph.D., Psy.D.**
Russ Mason, M.S.
- 95 **The Biochemistry of Alternative Medicine: Supporting Mental Health with Polyunsaturated Fatty Acids**
Joseph R. Cronin, Ph.D.
- 101 **Yagyopathic Herbal Treatment of Pulmonary Tuberculosis Symptoms: A Clinical Trial**
Meenakshi Raghuvanshi, M.Sc., Pranav Pandya, M.D., and Rajani R. Joshi, Ph.D.
- 106 **Race and Alternative and Complementary Medicine Use by Elderly Patients**
E. Paul Cherniack, M.D., and Cynthia X. Pan, M.D.
- 109 **Legal Matters: A Legal Audit for Integrative Practice: Recognizing and Working with Legal Issues—Part I**
Alan Dumoff, J.D., M.S.W.
- 116 **LiteratureWatch**

Cover: *Ginkgo biloba*

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Yagyopathic Herbal Treatment of Pulmonary Tuberculosis Symptoms

A Clinical Trial

Meenakshi Raghuvanshi, M.Sc.,
Pranav Pandya, M.D., and Rajani R. Joshi, Ph.D.

Pulmonary tuberculosis (TB) is a major public health problem across the globe. Every year, approximately 80,000 new cases are reported in India alone. The high frequency of drug resistance, complications of sequential updating of multiple drug regimens, and side-effects (such as hepatotoxicity)¹⁻² limit the efficacy of allopathic TB treatment.

Ayurvedic herbal medicines such as *rudanti*, *rudravanti*, *vasa*, and *kantkari*, are effective³⁻⁴ but oral administration of these usually produces slow healing. *Yagyopathy* (*yagya*-therapy) enables pulmonary administration of the herbal medicines and may be a more efficient mode for treating pulmonary diseases in general and pulmonary TB in particular.*

Although several case studies of the healing effects of *homa*-therapy⁵ have been reported for healing diabetes and some psychological disorders, none of the studies have mentioned use of any herbal medicines: Cow-dung, *ghee* (clarified butter) of cow-milk, and mantras repeated at sunrise and sunset are supposed to be the key factors in this *agnihotra* based *homa*-therapy.

To the best of our knowledge, this is the first thorough scientific study on the efficacy of *yagyopathy* as a mode of pulmonary administration of Ayurvedic medicines.* We have also conducted clinical trials on patients with pulmonary tuberculosis.

Materials and Methods

Yagyopathy is a therapy derived from the Vedic sciences.^{6,7} This mode of treatment requires the patient to perform a *yagya* (an *agnihotra* or fire-ritual) and use a selected combination of herbal medicines.

Experimental Procedures

Specific types of wood from medicinal trees (according to Ayurveda) are lit in special types of *agnikunda* (usually called "fire-pits"). A fire-pit is used for a sacrificial fire or for a pot (altar) or a small reservoir-type clay or concrete-structure (made on the ground) in which the *yagya* fire is ignited.

The shapes of the fire-pits are selected from those described in the Vedic scriptures. The fire pit's internal structure is an inverted pyramid, which provides controlled temperature variation and optimal energy dissipation. Fire-pit shapes are selected according to the type and purpose of *yagya* and fire-pit size depends upon how many people are supposed to perform the *yagya* simultaneously for what period of time. Other factors include how big an area is to be covered and what application the fire-pit is used for.

For this *yagyopathy* group of trials, the fire-pit used was shaped as a *padma kunda* (a circular pit with a circular bottom and top and a lotus-shaped boundary). This fire-pit was constructed in the center of the Yagyopathy Laboratory (of the Brahmvarchas Research Institute, Dev Sanskriti University, Shantikunj) in Haridwar, India. This *kunda* had an ~18-cm radius at the top and an 11-cm radius at the bottom, and was 18 cm in depth.

The laboratory was surrounded by glass walls with appropriate facilities for controlled ventilation and exhaust through a chimney that was connected (on the terrace of the laboratory) to instruments used to collect and analyze the gases, fumes, and vapors from the fires. This laboratory was maintained in nearly sterile conditions and was surrounded by green plants in a pollution-free, calm, and clean environment.

The wood used in *yagya* has to be dry, free from dust, dirt, insects, and worms. The wood is cut into small sticks of varying sizes (called *samidhas*) according to the size of the fire-pit. In *yagyopathic* procedures, the *samidhas* are sterilized and dried before use. The number of wood sticks is kept to the minimum required to produce a continuous, yellow-colored bright flame that rises slightly above the fire-pit. The wood strips are arranged in the fire-pit to produce slow but continuous combustion with a controlled air-supply from the fire-pit's bottom and intermediate layers. These requirements were met for this study.

*Joshi RR, Raghuvanshi M, Pandya P. *Yagyopathy* vs. oral and i.v. drug administration: Evaluation for pulmonary TB using physiological compartment modelling. J Pharmacol Kinetics Pharmacol Dynamics submitted for publication.

Key Sanskrit and Ayurvedic Terms^a

Agnihotra—In Ayurvedic practice, the act of “sacrificing” an offering to Agni (fire) by burning it

Ahuti(s)—The offerings that are sacrificed with fire (burnt) or the ritual that accompanies such oblations

Homa—Ayurvedic term for the act of making fire oblations or sacrifices to the gods, using clarified butter (*ghee*) and herbal preparations

Mantra—Vedic hymns or prayers; specific configurations of syllables corresponding to specific phonological or sound patterns comprising a “sacred formula” that is addressed to or focused on an individual deity or sublime cosmic power center.

Sukhasana—Regarded as being one of the easiest and most comfortable yoga positions, suitable for beginners to practice and appropriate for people who are weak or ill; it entails sitting on the ground, spine erect, with lower legs crossed, but not flat on the ground

Yagya—An ancient Vedic verbal root referring to sacrifice, altruistic deeds, adoration, or worship; in later Vedic texts, “yagya” is a part of word compounds that refer to “the act of sacrifice or worship”

Yajn—A generic Vedic term for worship, devotion, prayer, or praise; in late Vedic usage, the term referred to specific worship practices

^aMonier-Williams M. A Sanskrit-English Dictionary. London: Oxford University Press, 1974 and Ref 9.

The procedure was performed every day in the early morning (usually, for some time during the 1–2-hour time interval around sunrise). The subjects who performed the *yagya* sat around the fire-pit, on cotton or jute sheets. They sat in a manner that keeps the spinal cord erect, in a *sukhasana* position. For our procedure, 7 people sat comfortably around the fire-pit.

Having lit the fire (after performing invocation prayers) with the help of pure *ghee* and a small quantity of camphor, while chanting specific *mantras*, the subjects began the *yagya* itself.

During the *yagya*, measured quantities (called *ahutis*) of a specific herbal powder were offered in the *yagya*-fire (“sacrificed”) by each participant with collective rhythmic chanting of a prescribed Vedic *mantra*. This cycle was continued for a specific time interval. The herbal powder was prepared from prescribed herbal medicines together with some nutritious components and naturally fragrant and sweet substances (see box entitled Herbal Preparation for the *Yagyopathic* Trial).

A special deep (nasal)-breathing yoga exercise (*pranayama*) was practiced by each patient after every 2–3 minutes while sacrificing the *ahutis*. The cycle of *ahutis* was resumed after 5 minutes of this exercise. This sequence was repeated 5–6 times every day.

All of the subjects, in a state of relaxation, continued a harmonious deep-breathing exercise for 10–15 minutes after the last *ahuti*. Each subject performed the procedure every day, in the same laboratory, during the same time interval. Each complete procedure thus corresponded to a pulmonary administration of the combined Ayurvedic drugs (products emitted by fumigation, sublimation, vaporization, or other reactions of the herbal powder in the *yagya*-fire) via oral and nasal inhalation.

Clinical trials were designed for this mode of treatment, as for any other, via sequential (e.g., weekly or fortnightly) examinations of clinical, blood, biochemical, and pathologic testing in the control and experimental groups. Details are reported below and key information is summarized in Tables 1 and 2.

Herbal Medicines and Other Fumigating Substances

For *yagyopathic* treatment, mango (*Mangnifera indica*) or *palash* (*Butea frondosa*) wood was used to light the fire. Herbal medicines in appropriate combinations prescribed in Ayurveda were used for *yagyopathic* treatment of pulmonary tuberculosis.

Approximately 50 g of the prescribed powder was used per person in 15 minutes of offerings made in the *yagya*-fire. An herbal preparation of a specific combination of a dry, coarsely ground powder comprised of a number of medicinal herbs was also used (see box entitled Herbal Preparation for the *Yagyopathic* Trial). The latter were purchased from Arya Vastu Bhandar, Dehradun (Uttaranchal, India). The fine grinding and filtering were done by Pharmacy, Shantikunj, Hardwar, India.

Clinical Trials

Fifteen (15) patients (10 male and 5 female), ages 16–60, were treated for different symptoms of pulmonary tuberculosis from January 2003 to October 2003 with *yagyopathy*; 6 subjects were 16–25 years old. Seven (7) 15 patients were not taking any allopathic medicines. Of the remaining subjects, 3 were already resistant to the allopathic drugs but still used them (as prescribed by allopathic doctors) because it was their habit to do so or for other psychologic reasons.

Some of the subjects (mostly those in the older age group) had difficulty with deep breathing and were also given oral doses of the herbal medicines in small quantities (amounting to only 10 percent of what could be prescribed in conventional Ayurvedic treatment).

Depending how much each patient’s health improved, the average consecutive period of participation in the study was approximately 35–75 days. The average duration of the each procedure per day was approximately 45 minutes.

Table 1. Qualitative and Quantitative Clinical Features of Subjects^a

Symptoms	Total	Asymptomatic	Relieved	Static	Aggravated	Cases improved
Fever	7	2	4	1	0	86%
Cough/expectoration	9	1	8	0	0	100%
Chest pain/sensation of heaviness	9	2	6	1	0	90%
Underweight	5	0	5	0	0	100%
Loss of appetite	6	0	6	0	0	100%

^a Data on outlier subject not included.

Reasons for study dropouts usually include: (1) relief from symptoms; (2) transfer of patients to a new location or other logistical inconvenience; (3) death. During this study, only 2 patients dropped out without complete cures because of the second reason and 1 patient died; the latter subject was older than 56 and had the disease in a severe stage. This patient had become resistant to allopathic medicines for the past 3 years. His statistical outlier data were not used in our analysis.

For other subjects, there were at least 2–4 sequential readings on different clinical, pulmonary, pathologic, blood, biochemical, electrophysiologic, and cardiology parameters.

The following parameters were recorded for each patient on the first day of the experiment and then successively, for a duration of 15–25 days (duration was chosen according to the initial condition of each patient):

- *Physical*—body weight, pulse rate, respiration rate, body temperature
- *Pathologic*—sputum test for the presence of acid-fast bacillus (AFB) and X-ray
- Hematologic and biochemical—hemoglobin (Hb), erythrocyte sedimentation rate (ESR), total white blood corpuscle count (tWBC), eosinophil count (total), blood glucose, blood pressure (BP), polymorphs, total lymphocyte percentage count, monocyte percentage count, platelet count, albumin concentration, alkaline phosphate concentration, total bilirubin concentration, creatinine concentration
- Radiologic—X-ray
- Pulmonary functions—Forced vital capacity (FVC), Forced expiratory volume in one second (FEV₁), maximal voluntary ventilation (MVV), peak expiratory flow rate (PEFR)
- Cardiology—electrocardiogram
- Electrophysiologic—alpha electroencephalogram (alpha EEG), electromyogram (EMG), galvanic skin resistance (GSR).

Apart from these tests, information on general weakness, appetite loss, coughing, chest or body pain, history of the disease and earlier treatment (if any), reactions to allopathic medicines (if any), were also collected from the patients via a questionnaire.

The experimental procedure was noninvasive and the methods used for the tests/measurements on the above parameters were standard. The study was done per standard ethical norms.

Statistical Analysis and Results

All parameters except platelet testing, sputum-testing, and X-rays were observed and recorded in the laboratories of Brahmavarchas Research Institute. The latter were observed and recorded in the Ratnabharti Diagnostic Centre, Jwalapur, Haridwar, India. For a cross-check, the tests done in the Brahmavarchas laboratories were also conducted in some other laboratories on the same or the next day for some patients, who were selected randomly from among volunteers for the extra testing.

Statistical analysis was conducted to test the variation of parameters among these patients. Variance tests showed that the entire

Herbal Preparation for the Yagyopathic Trial

The preparation used included the following herbs:

- *Adhatoda vasica* (vasa)
- *Aegle marmelos correa* (bael)
- *Aquilaria agallocha* (agar)
- *Asparagus racemosus* (shatawar)
- *Arilmyristica fragrans* (javitri)
- *Balce kubati* (kamal gatta ki giri)
- *Capparis wigh* (rudanti)
- *Cress cretica* (rudravanti)
- *Cedrus deodara* (deodara)
- *Cinnamomum tamala* (tezpatra)
- *Commiphora mukul* (google)
- *Convolvus pluricaulis* (shankpuspi)
- *Crocus sativa* (keshar)
- *Desmodium gangeticum* (shaliparni)
- *Gmelina arborea* (gambhari)
- *Leptadenia reticulata* (jivanti)
- *Mesua ferrea* (nagkeshar)
- *Myristica fragrans* (jaiphal)
- *Nelumbium speciosum* (neelkamal)
- *Oroxylum indicum* (shyonak)
- *Pterocarpus santalinus* (red chandan)
- *Santalum album* (white chandan)
- *Solanum indicum* (badi kantkari)
- *Solanum xanthocarpum* (choti kantkari)
- *Stereospermum suaveolens* (padhal)
- *Swertia chirata* (chirayta)
- *Syzygium aromaticum* (laong)
- *Tephrosia purpurea* (sharpunkha)
- *Tinospora cordifolia* (giloy)
- *Uraria picta* (prasniparni)
- *Valeriana wallichii* (tagar)
- *Withania somnifera* (ashwagandha).

Substances with healthy constituents such as ghee (clarified butter) of cow's milk, *Hordeum valgar* (barley), and *Sesamum indicum* (til), were also used in the herbal preparation. Small amounts of sugar and *Vitis vinifera* (big raisins) were used as sweet substances.

experimental group except for the outlier (described above) was homogenous (belonging to the same statistical population). Use of Student's *t*-test was justified; the paired *t*-test was used to determine the significance of changes in the parameter values between two successive readings (e.g., between baseline and first reading after approximately 2 weeks after the study began).

The results, obtained with high statistical confidence (level above 95 percent) showed an overall improvement of clinical significance in most patients. These results are summarized in Table 1.

Table 1 shows the number of patients who had specific symptoms with respect to the different features and the number of subjects who improved and became asymptomatic, totally recovered, remained static, or worsened by the time of completion or discontinuation of their participation in *yagyopathy*. The last column of Table 1 shows the percentage of cases improved. The features that were within normal healthy limits for all patients are not included in the table. (The single case that appears often in the static and aggravated columns is the outlier case).

Table 2 shows the pathologic findings in the subjects. The cardiology and electrophysiologic parameters in the first and the successive readings were in the clinically normal range in the entire

Table 2. Hematologic, Pulmonary, X-Ray, and Other Pathologic Features of Subjects^a

Features	Total	Asymptomatic	Relieved	Static	Aggravated	Cases improved
Low Hb	3	3	0	0	0	100%
High ESR	7	3	3	1	0	86%
AFB +Ve	2	1	1	0	0	100%
High tWBC	1	0	1	0	0	100%
High TLC	2	0	2	0	0	100%
Polymorphs	5	2	3	0	0	100%
Alkaline phosphate	7	1	5	1	0	86%
Low FEV ₁	14	5	8	1	0	93%
Low PEFR	14	5	8	1	0	93%
Infiltration	7	3	3	1	0	86%
Fibrosis	4	1	0	1	0	Incomplete ^b
Pleural effusion	4	1	3	0	0	100%

^aCardiology and electrophysiologic results not shown in Table 2 because these readings remained within normal range and changes were not statistically significant.

^bIncomplete, because 2 subjects had left the study before a second X-ray scan was feasible.

Hb, hemoglobin; ESR, erythrocyte sedimentation rate; AFB, acid-fast bacillus; Ve, positive; tWBC, total white blood corpuscle count; TLC, total lymphocyte percentage count; FEV₁, forced expiratory volume in 1 second; PEFR, peak expiratory flow rate.

group. There were no variations of statistical significance in the pre- and postexperiment measurements of these parameters. This was also the case with some other parameters, namely, body temperature, respiratory rate, pulse rate, BP, blood glucose (except in one patient with diabetes, who had blood sugar readings far above normal and whose BP was also on the higher side of normal), total bilirubin, creatinine, albumin, monocytes, and blood platelets.

The subjects' body weight had gradually improved (by approximately an increase of 4 kg on average in 5 weeks) in patients who were initially underweight. Healthy maintenance or slight gain in weight was also observed in others.

Only 2 patients (other than the outlier) had low Hb (average was approximately 9 G percent); among these subjects, there was an improvement of 0.5–1.5 (G percent) in successive readings after continuing the *yagyā*. In general, the average preexperiment value in the group was ~11.5 (G percent) and in the postexperiment case was ~12 (G percent).

Reduction in the subjects' ESR was significant both statistically and clinically. Most importantly, in the first reading (taken after 15–20 days into the trial), the average ESR among the 6 patients whose ESRs were far above normal had been reduced from 48.2 mm to 40.2 mm in the first hour (measured by the West method), with a statistical confidence level of ~98 percent. By the third or fourth readings, these patients' ESRs were reduced further to approximately 20 units.

Sputum tests showed that only 2 patients were AFB-positive and these became negative within 5 weeks. For other subjects, the AFB was not detected in the first reading and remained negative throughout the course of the study.

Only 1 patient had a tWBC that was slightly above normal, which had come down to 7800 cells/mm³ (well within the healthy range). The lymphocyte readings were similar—the average initial value (52 percent) in the 2 patients having slightly high lymphocyte counts at baseline had come down to a normal level (45 percent) by the time the first reading was

taken. Both tWBC and lymphocyte counts remained within healthy limits in all postexperiment readings.

Polymorph counts were above the normal level in 5 patients; this had reduced on average from 73.2 to 63.4 percent, with a 96-percent statistical confidence after the first phase of the study and remained within healthy levels throughout the remainder of the experimental period.

Although the eosinophil levels were not very high in any patient, on average, this level was reduced from 5.4 to 2.7 percent from the pre- to postexperiment condition after the first phase of the trial with an ~96.4 percent statistical confidence level. One patient's second reading was not normal because he had caught severe cold and had cough at that time, but all of the other subjects had normal eosinophil levels healthy limits in all readings.

The alkaline phosphate level was high in 5 patients (other than the outlier case and another patient who had diabetes), with a statistical confidence of 99.2 percent; the level was reduced on average from 225.8 to 159.6.

Pulmonary functions had improved in the entire group (except for the single outlier). Clinical and statistically significant changes were observed from the second reading to the end of the study period. FEV₁ had increased on an average from 37.8 to 51.8 (percent predicted) between the second and third reading with a statistical confidence level of 99 percent. Interestingly, with equally high statistical confidence, the nonallopathy-treated group showed an average increase of about 6 units (percent predicted) between the first and second readings itself.

Similar improvements were recorded in MVV and FVC. The average increases in PEFR from the second to third reading was 30–40 (percent predicted) in the entire group (except for the outlier) with a statistical confidence of approximately 97 percent; the average increase in the nonallopathy-treated group between the first and second reading itself was approximately 7 units (percent predicted) with a higher statistical confidence.

Chest X-rays revealed that pleural effusion was present in 4 patients before they entered the study; these subjects were cured completely in approximately 3 months. Six (6) patients had infiltration; of these, 3 were cured and 2 had improved considerably in approximately 3–4 months. One (1) patient had infiltration in the right lung and fibrosis in the left; there was noticeable reduction in infiltration; although no improvement was however seen in her left lung. Two (2) more patients had fibrosis; no changes in chest radiography could be recorded for them because they had left the study in less than 3 months. The outlier patient had severe fibrosis and his X-ray showed that a sizable portion of his lungs were damaged before he joined our study.

Responses to a questionnaire showed that all the patients had experienced relief or reduction in their earlier complaints of loss of appetite, acidity, coughing, expectoration, pain or heaviness in the chest and/or, fever or feverishness. The statistical results on alkaline phosphate, eosinophil, ESR, chest X-ray, polymorphs, provided physical data to support these subjective experiences. Most importantly, the subjects all had felt some kind of psychologic uplift from participation in the trials; this joy of daily participation in the *yagya* seems to have motivated them to continue with this activity for a period of several weeks to months.

Discussion and Conclusions

We have evaluated, via clinical trials, the potential of *yagya*-based therapy (*yagyopathy*) for treating pulmonary tuberculosis symptoms. In these *yagyopathy* trials, the indigenous medicinal herbs prescribed in Ayurveda for treating this disease were used in special combination with additional herbs and healthy substances as offerings in a *yagya*-fire. Specific medicinal products were released thereby in sublimated, subtlized, ionized, or colloidal forms along with the fumes, vapors, and gases. Oral and nasal inhalation of these corresponds to pulmonary drug administration.

Clinical trials conducted so far this study have produced excellent effects as shown in important measures, such as chest radiography, pulmonary functions, and ESR. The effects evident whether or not subjects were using allopathic medicines concurrently. Gender and age group did not affect the outcomes.

Significantly, definite improvement or complete cure was seen even in subjects who had become resistant to allopathic drugs but whose disease had not advanced up to alarming state (as was the case in the outlier subject).

It would be interesting to extend the study to a larger number of patients under each category (age, gender, taking/not taking allopathic or Ayurvedic drugs) and also to conduct a crossover analysis while incorporating a control group comprised of subjects who may or may not take allopathic or other medicines but would not participate in *yagya*. We plan to continue ongoing research along these lines and conduct a biostatistical survival analysis with appropriate nonparametric regression models to estimate the doses/durations of *yagya*-therapy as functions of important parameters.

Pulmonary drug administration is projected by researchers as the prime mode of drug delivery in the future.⁸ Study of alternative ethnotherapies such as *yagyopathy*, which is predominantly a

mode of healing through oral and nasal inhalation, becomes more relevant in this context. Our recent research on pharmacokinetic aspects along with some in vitro trials* showed significant efficacy of the *yagya*-based method over oral and i.v. administration of allopathic drugs (namely, isoniazid and pyrazinamide) for treating pulmonary tuberculosis.

The clinical trials in this study validates these evaluations further. Similar investigations on other diseases would be beneficial.

The general feeling of psychologic soothing experienced by the patients in this study gives rise to an innovative research direction in the integral science of medicine. These effects should be investigated (via specially designed experiments) to determine whether they could be the result of inhaled drugs or the rhythmic chanting of *mantras* during the *yagya* experiments.

The distinct syllabic configurations of the Vedic hymns (*mantras*), the phonologic patterns of the subjects chanting in classical Indian ragas, and the consequent mapping of brain-impulses have been the subject of scientific inquiry recently.⁹

Research on such topics has become more significant now when mental and psychosomatic disorders and ailments are posing increasing challenges for the health scientists. Studies on these aspects, together with research on herbal medicine and *yagyopathy*, may further the advancement of interdisciplinary research in alternative and complementary medicine. □

References

1. Khasnabis S, Escuyer VE, Chatterjee D. Emerging therapeutic targets in tuberculosis in post-genomic era. *Expert Opin Ther Targets* 2002;6:21–40.
2. Edwards CR, Edwards CRW, Bouchier IAD, eds. *Davidson's Principles and Practice of Medicine*. Edinburgh: Churchill Livingstone, 1991.
3. Satyavati GV, Raina MK, Sharma M, eds. *Medicinal Plants of India*. New Delhi: Indian Council of Medical Research, 1976.
4. Claeson UP, Malmforms T, Wikman G, Bruhn JG. *Adhatoda Vasica*: A critical review of ethnopharmacological and toxicological data. *J Ethnopharmacol* 2000;72(1–2):1–20.
5. Mondkar A. *Agnihotra* and microbes—A laboratory experience. *Satsang Issues* 1982;9:7–9.
6. Sharma S. *Yagya Ka Gyan Vigyan* [the Pundit Shriram Sharma Acharya Vangmaya Series, No. 25]. Mathura, India: Akhand Jyothi Sansthan, 1995.
7. Sharma S. *Yagya Eka Samagra Upchar Prakriya* [the Pundit Shriram Sharma Acharya Vangmaya Series, No. 26]. Mathura, India: Akhand Jyothi Sansthan, 1995.
8. Newman SP, Wilding IR, Hirst PH. Human lung deposit data—the bridge between in-vitro and clinical evaluations for inhaled drug products? *Intl J Pharmaceutics* 2000;208(1–2):49–60.
9. Joshi RR. *The Integrated Science of Yagya*. Mathrua, India: Yug Nirman Yojna Press, 2000.

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