Medicinal Smoke (*Havan*) Reduces Airborne Bacteria*

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From time immemorial, human beings have used smoke of medicinal plants for curing disorders. Smoke produced from natural substances has been used extensively in many cultures and famous ancient physicians have described and recommended such use. Under the continuous Saraswati-Indus civilization going back to ~7500 BC [i.e., ~9500 Before Present (BP)] the great *rishis* (saints) used to perform *agnihotra-yagnas* to purify the environment as described in Rigveda – the most ancient compilation of knowledge on earth by sublimating the *havana sámagri* (mixture of wood and odoriferous and medicinal herbs) in the fire accompanied by the chanting of Vedic mantras described in Rigveda – the most ancient compilation of knowledge on earth.

This study represents a comprehensive analysis and scientific validation of our ancient knowledge about the effect of ethnopharmacological aspects of natural products' smoke for therapy and health care on airborne bacterial composition and dynamics, using the Biolog® microplate panels and Microlog® database. In this study, we have designed an air sampler for microbiological air sampling during the treatment of the room with medicinal smoke. In addition, elimination of the aerial pathogenic bacteria due to the smoke is reported too. We have observed that 1 h treatment of medicinal smoke eminateation by burning wood and a mixture of odoriferous and medicinal herbs (*havan sámagri* = material used in oblation to fire all over India) on aerial bacterial population caused over 94% reduction of bacterial counts by 60 min and the ability of the smoke to purify or disinfect the air and to make the environment cleaner was maintanied up to 24 h in the closed room. Absence of pathogenic bacteria *Corynebacterium urealyticum, Curtobacterium flaccumfaciens, Enterobacter aerogenes (Klebsiella mobilis), Kocuria rosea, Pseudomonas syringae* pv. *persicae, Staphylococcus lentus,* and *Xanthomonas campestris* pv. *tardicrescens* in the open room even after 30 days is indicative of the bactericidal potential of the medicinal smoke treatment. We have demonstrated that using medicinal smoke it is possible to completely eliminate diverse plant and human pathogenic bacteria of the air within confined space.

Work has implications to use the smoke generated by burning wood and a mixture of odoriferous and medicinal herbs, within confined spaces such as animal barns and seed/grain warehouses to disinfect the air and to make the environment cleaner. Work indicates that certain known medicinal constituents from the *havan sámagri* can thus be added to the burning farm material while disposing unwanted agriculture organic material, in order to reduce plant pathogenic organisms. In particular, it highlights the fact that we must think well beyond the physical aspects of smoke on plants in natural habitats and impacts heavily on our understanding of fire as a driving force in evolution. We have demonstrated that using medicinal smoke it is possible to

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contain diverse pathogenic bacteria of the air we breathe. The work also highlights the fact about medicinal smoke and that a lot of natural products have potential for use as medicine in the smoke form as a form of drug delivery and as a promising source of new active natural ingredients for containing indoor airborne infections within confined spaces used for storage of agriculture comodities. The dynamic chemical and biological interactions occurring in the atmosphere are much more complex than has been previously realized. The findings warrant a need for further evaluation of various ingredients present in the complex mixture of odoriferous and medicinal herbs, individually and in various combinations to identify the active principles involved in the bactericidal property of the medicinal smoke, applied in the above discussed fashion.