Research Article

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AN EXPERIMENTAL STUDY ON ANTI-BACTERIAL AND ANTI-FUNGAL EFFECT OF DHOOPANA KARMA WITH APARAJITHA DHOOPA CHOORNA

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ABSTRACT

Clean air is one of the basic requirements for the well-being of human beings. Airborne diseases are on the rise than the vector-borne diseases, according to WHO around 4.2 million people die every year due to air pollution. As concern over the outside air grows, so does the concern over the indoor air environment where the individual spends most of the time. The indoor air environment is a potential source of airborne pathogenic micro-organisms which causes adverse effect to the individuals. The hospital air environment is more dangerous, as there are potential carriers and cases which expel the micro-organism into the environment resulting in nosocomial infections. Many methodologies have been adapted to disinfect the rooms, among which formaldehyde fumigation is most common, but such methodology is very harmful to the individual. Dhoopana is one such treatment modalities explained in the classics for the disinfection of various rooms and places. So, this study was taken up to evaluate the effect of Anti-Microbial and Anti-Fungal effect of Dhoopana Karma using Aparajitha Dhoopa Choorana. The Objective of this study is to assess the Anti-Bacterial and Anti-Fungal property of Dhoopana Karma with Aparajitha Dhoopa Choorana. Three Microorganisms were selected - *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Aspergillus niger* and kept inside a closed glass chamber where Dhoopana was done. Formaldehyde fumes were given as a standard. There was a significant reduction in the Colony Forming Units of all the three microorganisms.

Keywords: Dhoopana karma; Indoor air environment; Air borne disease.

INTRODUCTION

Ayurveda, one of the oldest life sciences, emphasised mainly on maintaining the health of the individual¹. It has always tried to establish a connection between the man and the environment. Air is one of the main components by which life is sustained. Clean air free from pollutants is required for living a healthy life. However, due to the activities of the man, the environment is getting vitiated, which returns the favour to the man in the form of diseases, causing epidemic or pandemic states. Indoor air environment consists more of the pathogenic organisms due to the proximity to human activities and enclosed area. It represents an essential micro-environment in which the people spend a large part of their time each day².

As there is the presence of many pathogenic microorganisms which are capable of causing diseases³, especially in the indoor air environment, certain measures like fumigation, proper ventilation and other methods have to be adopted. Decontamination of the enclosed environment is an important consideration for the control or remediation of pathogens.

Fumigation is one of the methods of disinfection, adopted for making the environment free from harmful microorganisms⁴. It can either be in the form of concurrent, terminal or in the form of pre-current disinfection⁵. In the classics also different kinds of yaga, homa, Havana and Dhoopana were practised to tackle the poisonous effect of the dushita vayu⁶. Dhoopana (fumigation with certain dravyas) is one such modality for the purification of the internal air environment. This is conclusive by observing the

references regarding the Dhoopana procedure in the post-operative rooms⁷, kumaaragaara⁸ and sootikaagara etc. As we can observe that these places are more prone to the spread of infection and Dhoopana procedure has been explained as a remedy to stop the spread of the disease. Application of such traditional disinfection methods is far safer than the newer chemical disinfection methods. So, to establish the fact that traditional disinfection methods like Dhoopana are safe, this study has been taken up.

Objectives

To assess the Anti-Bacterial and Anti-Fungal property of Dhoopana Karma with Aparajitha Dhoopa Choorana⁹ (Table 1)¹

MATERIALS AND METHODS

Experimental Source

A closed glass chamber with a lid of size 11.5 ft³ was taken for the study. The species of the organisms - Bacteria: *Pseudomonas aeruginosa* and *Staphylococcus aureus*, and Fungus: *Aspergillus niger*; used for the study were cultured in SDM Centre for Research in Ayurveda and Allied Sciences, Udupi. A mud Sharava with lid was used for the dhoopana.

Preparation of the perti dish

Serial Dilution of 1/1000 was fixed for the study for the ease of counting.

Preparation of the Sharava for Dhoopana

10 gm of Aparajitha Dhoopa Choorna was taken and put over the burning charcoal inside a Mud Sharava and smoke was produced. Ghee was used as the combustion.

Preparation of the formaldehyde fumes

The dose of the Formaldehyde fumigation was fixed as 10 ml of formaldehyde solution in 100 ml of distilled water. The mixture was taken in a glass beaker and kept over the tripod stand. It was then heated using a Bunsen burner with mild flames and fumes were generated.

Procedure

The petri-dish containing the micro-organism was placed in the centre of the Glass Chamber. Dhoopana using a mud sharava was done by inside the glass chamber by taking 10 gm of Aparajitha Dhoopa Choorna and the chamber was kept closed. In the standard group, the formaldehyde solution was used for fumigation. After the specified period (as mentioned in each group – Table 2), the petri dish was removed and sent for culture.

The Organisms were then incubated according to their incubation period (Table - 3). Then using the plate count method with the help of digital colony meter, the colonies were counted for each group and each organism.

Table 1: Ingredients of Aparajitha Dhoopa Choorna

Dravya	Botanical Name	Parts Used
Guggulu	<i>Commiphora wightii</i> (Arn.) Bhandari	Gum Resin
Mayurashikha	<i>Actinopteris radiata</i> (J. Koenig ex Sw.) Link	Whole Plant
Vaca	<i>Acorus calamus</i> L.	Rhizome
Sarja	<i>Vateria indica</i> L.	Resin
Nimba	<i>Azadirachta indica</i> A. Juss	Bark
Arka	<i>Calotropis procera</i> (Aiton) Dry and	Root
Agaru	<i>Aquilaria agallocha</i> Roxb.	Wood
Devadaru	<i>Cedrus deodara</i> (Roxb.) G. Don	Heartwood

Table 2: Grouping

Group A (Negative group)	Group B (Test Group 1)	Group C (Test Group 2)	Group D (Standard)
Inoculation of the microbes was done without any intervention.	Dhoopana is given using 10 gm of Dhoopa Chorna for 15 min	Dhoopana is given using 10 gm of Dhoopa Chorna for 30 min	Dhoopana is given using 10 ml of formaldehyde solution in 100 ml of distilled water for 30 min. Keeping the glass chamber closed for 30 min.

Table 3: Incubation period of micro-organisms

<i>Staphylococcus aureus</i>	37° C for 24 hrs
<i>Pseudomonas aeruginosa</i>	37° C for 24 hrs
<i>Aspergillus niger</i>	25° C for five days

Table 4: Results

Microorganism	Group 1	Group 2	Group 3	Group 4
<i>Staphylococcus aureus</i>	Heavy growth	Heavy Growth but less than group 1	660 CFU	900 CFU
<i>Pseudomonas aeruginosa</i>	Heavy growth	Heavy Growth but less than group 1	1500 CFU	900 CFU
<i>Aspergillus niger</i>	>15,000	10,000 - 15,000 CFU	75 CFU	40 CFU

Figure 1: *S. aureus* – group 1 **Figure 2: *S. aureus* – group 2**

Figure 3: *S. aureus* – group 3

Figure 4: *S. aureus* – group 4

Figure 5: *P. aeruginosa* – group 1

Figure 6: *P. aeruginosa* – group 2

Figure 7: *P. aeruginosa* – group 3

Figure 8: *P. aeruginosa* – group 4

Figure 9: *A. niger* – group 1

Figure 10: *A. niger* – group 2

Figure 11: *A. niger* – group 3

Figure 12: *A. niger* – group 4

RESULT AND DISCUSSION

A Comparison was done between the groups for each micro-organism, and the following results were obtained, as shown in Table 4.

As per the observation, the Dhoopana with Aparajith Dhoopa Choorna for 30 min showed significant result and is near comparable to the formaldehyde fumigation. In all the groups, the colony-forming units of the microbes have reduced from heavy growth to a mere countable colony-forming unit. A markable reduction was seen in organism *Staphylococcus aureus* and *Aspergillus niger*.

So, Aparajitha Dhoopa Choorna has indeed showed a significant anti-bacterial and anti-fungal property.

Further in-depth or *in-vitro* studies are required for the understanding of the mode of action of the dhoopa choorna on the microbes. A hypothesis on the mode of action can be made in 2 aspects; one is that the krimighna property of the dravya's used in Aparajitha Dhoopa Choorna led to the significant result. Most of the ingredients are having Laghu, Rooksha and Teeksha guna with Karma as krimihara. This could have led to a reduction in the colony-forming units. The second hypothesis can be related

to the chemical constituents present in the drugs which are proven anti-microbial and anti-fungal, which could have led to the corrosion occurring in the cell wall of the microbes leading to the death of the microbe.

CONCLUSION

The concept of the disinfection has been dealt with in the various sections of the classics. Among the various disinfection procedure like the sprinkling of the dravya into the air, application of the dravyas on the various places etc. Dhoopana is one such modality adopted for the disinfection. Various dravya's are used in various conditions and are delivered in the form of fumes. This methodology is safe (is not harmful to human beings), effective and economical. Thus, Aparajitha Dhoopa Choorna can be considered as an effective anti-microbial could also be one of the main reasons for this dhoopa choorna to act against the microbes and fungus in the study.

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