

## ANALYTICAL STUDY OF HERBAL FUMIGATION

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### ABSTRACT

**BACKGROUND:** There are 100 trillion of microbes in human body and millions of microbes around us in air clothes etc. A sterile environment is the necessity of every surgical procedure and sterilization of the Operation theatre, surgical instruments etc is compulsorily carried out before any surgical procedure by various methods like chemical disinfection, fumigation etc to avoid the nosocomial infections, surgical site infections, post-operative complications etc.

**AIM:** Fumigation of the Operation theatre is the first step and an inseparable part of any surgical procedure. In contemporary science various methods of sterilization are employed to sterilize major and minor operation theaters, dressing materials, different surgical equipments. Ayurvedic classics have explained sterilization under the concept of *Dhupana*, *Shastrapayana* etc. *Dhupana* is the method by which drugs of herbal, herbo-mineral or animal origin are used for fumigation. The current study was done to evaluate the anti-microbial property & to re-establish the *Sushrutokta Dhupana Yoga*.

**MATERIALS AND METHODS:** A single group analytical study was done to evaluate anti-microbial property of *Sushrutokta Dhupana Yoga* in the form of *Varthi*. 15 trials were done with 4 swab samples each before fumigation and after fumigation and total 60 swab samples were assessed. The assessment was done based on pre and post microbial load observed from swab culture & sensitivity test of the collected swabs.

**RESULTS:** The micro-organisms detected in the swab culture test were *Gram positive Staphylococci*, *Gram negative bacilli*, *Staphylococcus aureus* and *Klebsiella pneumoniae*. Fumigation with *Sushrutokta Dhupana Yoga* was found to have both bacteriostatic and bactericidal properties and showed positive results with p value of 0.001 which is highly significant.

**CONCLUSION:** *Dhupana* or Herbal fumigation with *Sushrutoktha Dhupana Yoga* was found to be effective against a varied range of micro-organisms and an efficient method of sterilization.

**Keywords** Anti-microbial, *Dhupana*, Herbal fumigation, *Sushruta*

**INTRODUCTION:** Ayurvedic treatises are oceans of knowledge and while writing these treatises, *Acharyas* have given equal importance to enlist every minute detail and one such procedure is the concept of sterilization. Sterilization is the process of freeing an article, a surface or a medium of

all micro-organisms.<sup>1</sup> In contemporary science various methods of sterilization are employed like heat, radiation, chemical disinfection etc to sterilize major operation theaters, minor operation theaters, all dressing materials, different surgical equipments before any surgical

procedure.<sup>2</sup> Gas-sterilization or fumigation is one among the different types of chemical sterilization. For the sterilization of major & minor operation theatre, chemicals like formaldehyde, ethylene oxide etc are commonly used.<sup>3</sup> In Ayurveda, sterilization has been explained under the concept of *Rakshakarma*(protective measures)<sup>4</sup>, *Dhoopana*(fumigation)<sup>5</sup>, *Shastrapayana*(sterilization of surgical instruments by dipping in hot liquids)<sup>6</sup>, *Chindyat Agnitapta Shalakena*(heating of instruments before using for excision)<sup>7</sup> etc. *Dhupana* is the method by which drugs of herbal, herbomineral or animal origin are used for fumigation. *Acharya Sushruta*, *Acharya Charaka*, *Acharya Kashyapa* have explained various *Dhupana Yogas* in various context like *Dhupana* of *Sutikagara*, *Vranitagara*, *Kumaragara* etc. *Acharya Sushruta* has explained *Dhupana* of *Vranitagara* with *Guggulu*(*Commiphora wightii*), *Aguru*(*Aquillaria agallocha*), *Sarjarasa*(*Vateria indica*), *Gourasarshapa*(*Brassicacampestris*), *Lavana*(salt), *Nimbapatra*(*Azadirachta indica*), *Sarpi*(ghee)<sup>5</sup>. The use of chemicals like formaldehyde, ethylene oxide etc has certain disadvantages like pungent smell leading to suffocation, irritation to eyes, mucus membrane & skin.<sup>3</sup> Hence there is a need to develop better drugs for sterilization. Also it is a need of the hour to evaluate the ancient concepts explained in Ayurveda with modern parameters. Hence, in this study an effort was made to analyze and re-establish *Sushruta*'s concept of sterilization.

#### AIMS AND OBJECTIVES:

- To evaluate the Antimicrobial properties of *Sushrutokta Dhupana Yoga*.

- To establish the concept of sterilization in Ayurveda.

#### MATERIALS AND METHODS:

##### METHOD OF COLLECTION OF DATA:

For this study, Minor OT of JSS Ayurveda Medical College & Hospital, Lalithadripura Road, Alanahalli, Mysuru, Karnataka was selected. As this was an analytical study, no ethical clearance certificate was obtained. Swab samples for the study were collected from OT table, OT light, OT trolley and OT wall of the minor OT. In each trial 4 samples were collected before fumigation and 4 samples were collected after fumigation. Similarly 15 trials were conducted and total of 60 samples were collected for the swab culture and sensitivity test. The study was conducted under a funded project of Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka and carried out for a period of 2 years. The laboratory investigations were carried out in SRL Diagnostics, Mysuru, Karnataka. Swab culture & sensitivity test before fumigation and 12 hours after fumigation were done (Fig No. 1-4).

##### Preparation of *Varthis*:

- Following raw drugs (selected parts) were bought from Govindshetty Herbal Shop, Mysuru and authenticated for identity, quality, and purity from the Department of *Dravyaguna*.
  - i. *Guggulu*(*Commiphora wightii*)
  - ii. *Agaru*(*Aquillaria agallocha*)
  - iii. *Sarjarasa*(*Vateria indica*)
  - iv. *Gourasarshapa*(*Brassica campestris*)
  - v. *Lavana*(Salt)
  - vi. *Nimbapatra*(*Azadirachta indica*)
  - vii. *Sarpi*(Ghee/clarified butter)
- The above raw materials except *Lavana* and *Ghrita* were made into fine powder

separately and mixed together in equal quantity by adding required quantity of ghee. The mixture was later converted into different sized moulds (*Varthis*) of 10gms, 20gms, and 50gms & was dried in sun light for 2 days. The *Varthis* were stored in an air-tight container.

**METHODOLOGY:**

For the present study, 10×10 square feet Minor O.T. of JSS Ayurveda Medical College and Hospital, Lalithadripura road, Alanahalli, Mysuru was considered. All the windows and doors were closed and made air-tight. Four swab samples were collected from the previously mentioned

sites following which one *Varthi* was placed at four corners and one at the centre of the room respectively. *Varthis* were dipped in *Ghrita* and ignited to produce fumes and *Dhupana* of the Minor O.T. was done. The Minor O.T. was left unopened for 12 hours after which four swab samples were collected again from the same sites. The collected swabs were sent for assessment of pre microbial load and post microbial load.

**ASSESSMENT CRITERIA:**

Assessment was done based on pre and post anti-microbial study of swab test-

**Table No 1: Grading for assessment of microbial load**

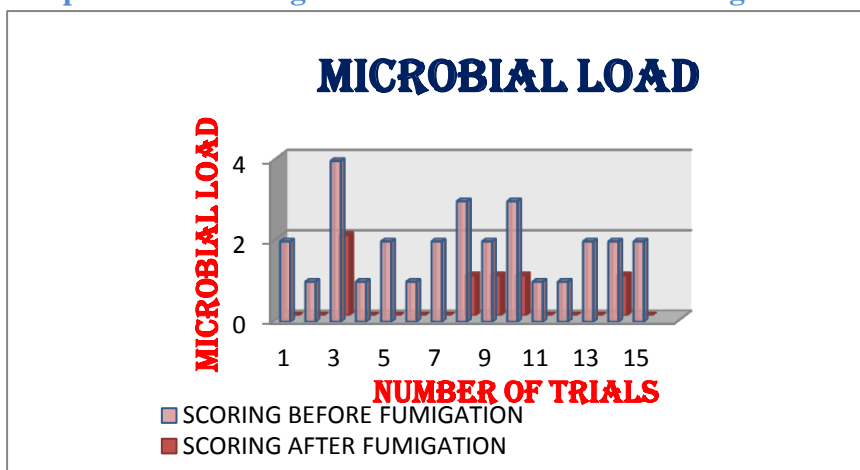
NO. OF BACTERIA	SCORING
No bacteria	0
10-20	1
20-50	2
50-100	3
>100	4

**Laboratory Investigations:**

**Statistical Analysis:** Statistical analysis was performed. Data was analyzed by Chi-

square test. The p value 0.001 was considered as significant.

**Graph No 1: Showing the microbial load before fumigation and after fumigation**



**Table no 2: Showing the microbial load scoring before fumigation and after fumigation in percentage**

SCORE	BEFORE	PERCENTAGE BEFORE	AFTER	PERCENTAGE AFTER	TOTAL	TOTAL PERCENT
NIL	0	0	10	66.7	10	33.3
10-20	5	33.3	4	26.7	9	30

20-50	7	46.7	1	6.7	8	26.7
50-100	2	13.3	0	0	2	6.7
100+	1	6.7	0	0	1	3.3

### RESULTS:

The micro-organisms detected in the swab culture test were mostly *Gram negative bacilli*. The swab culture & sensitivity test reports when statistically analyzed showed positive result with the p value of 0.001 which is highly significant. It was found that before fumigation there was a maximum microbial count and later decreased significantly after fumigation. Out of 15 trials, 10 trials showed complete destruction of the microbes and 4 trials showed considerable reduction in the bacterial growth.

### DISCUSSION:

Sterilization is an inevitable part of surgery that plays an important role in maintaining a sterile environment for conducting surgical procedures. Different methods of sterilization are applied in contemporary science for sterilization of various instruments, operation theatre according to the material used & necessity. Even in Ayurveda, sterilization has been explained extensively under various context like sterilization of *Vranitagara*, *Kumaragara*, *Shastras* etc by various methods like *Dhupana*, *Shastrapayana* etc. *Acharya Sushruta* explains about *Dhupana* of *Vranitagara* as a *Paschatkarma Vidhi*. Fumigation is the method by which we can sterilize the enclosed area by injecting the chemical which will kill or destroy microbes present in the air. By maintaining sterile environment in operation theatre we can control major part of exogenous infections. Fumigants are used where standards call for "zero Microbial tolerance" in products or living environments. Fumigants can reach where sprays, dusts, aerosols etc cannot reach.

Fumigation is often the quickest way of controlling an infestation, saving time and money. Generally, Formaldehyde or ethylene oxide is used for OT fumigation. These gases are toxic and potentially carcinogenic to humans<sup>8</sup>. It is also extremely irritating and both a dermal and respiratory sensitizer<sup>9</sup>. Hence several new safe chemicals are emerging but constrains of economy and the harmful effects of chemicals and several hours of closure of operation theatres makes it extremely important to search for better drugs to be used for this purpose. The drugs used in this *Dhupana Yoga* like *Guggulu*, *Sarshapa*, *Nimba* etc were found to be safe for human use & eco-friendly. Various studies have been conducted on these drugs which have revealed that the volatile principles in these drugs are having anti-bacterial, anti-microbial, bacteriocidal and bacteriostatic properties.

### CONCLUSION:

*Sushruta*, The father of surgery has explained about surgical procedures extensively with proper protocol to be followed during these procedures like *Poorvakarma* and *Pashchatkarma*. Based on the discussion above, it is clear that The *Sushrutokta Dhupana Yoga* used in this study in the form of a *Varthi* is a very effective formulation which can be used for fumigation of major and minor operation theatre without harmful side-effects or complications. Also it is economical and eco-friendly. Standardized use of this *Dhoopana Yoga* can help in preventing nosocomial & surgical site infections.

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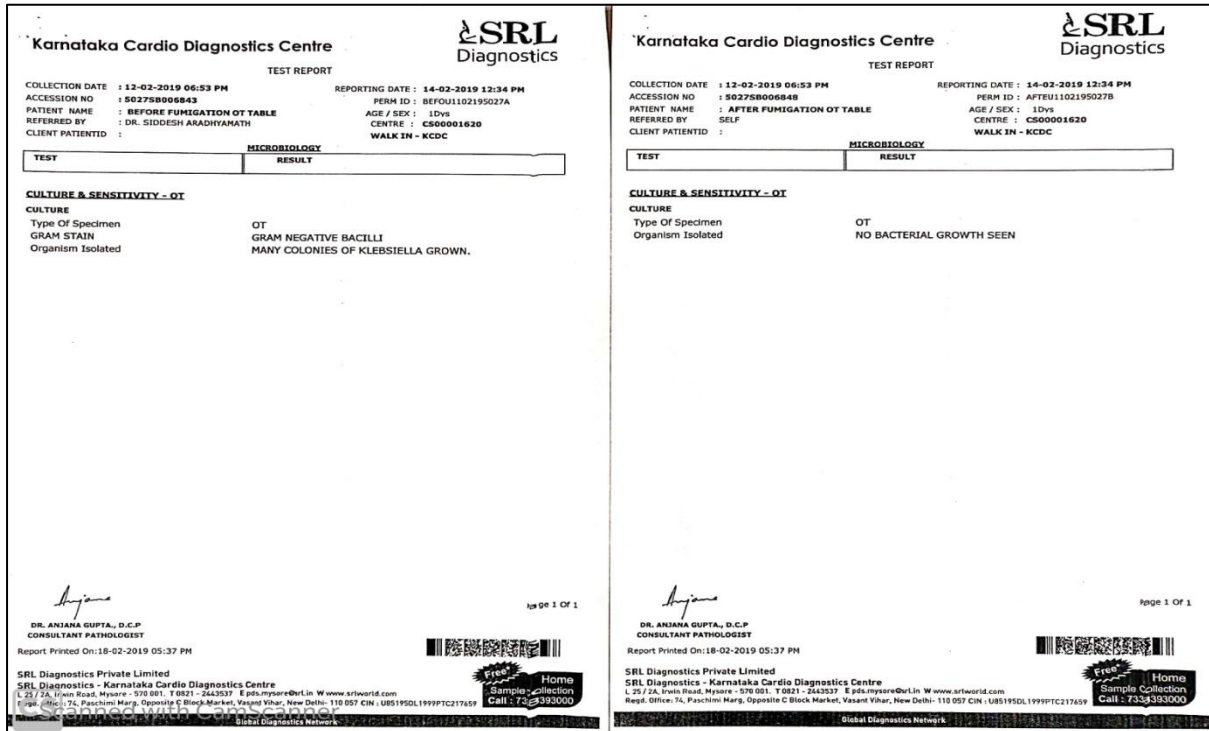
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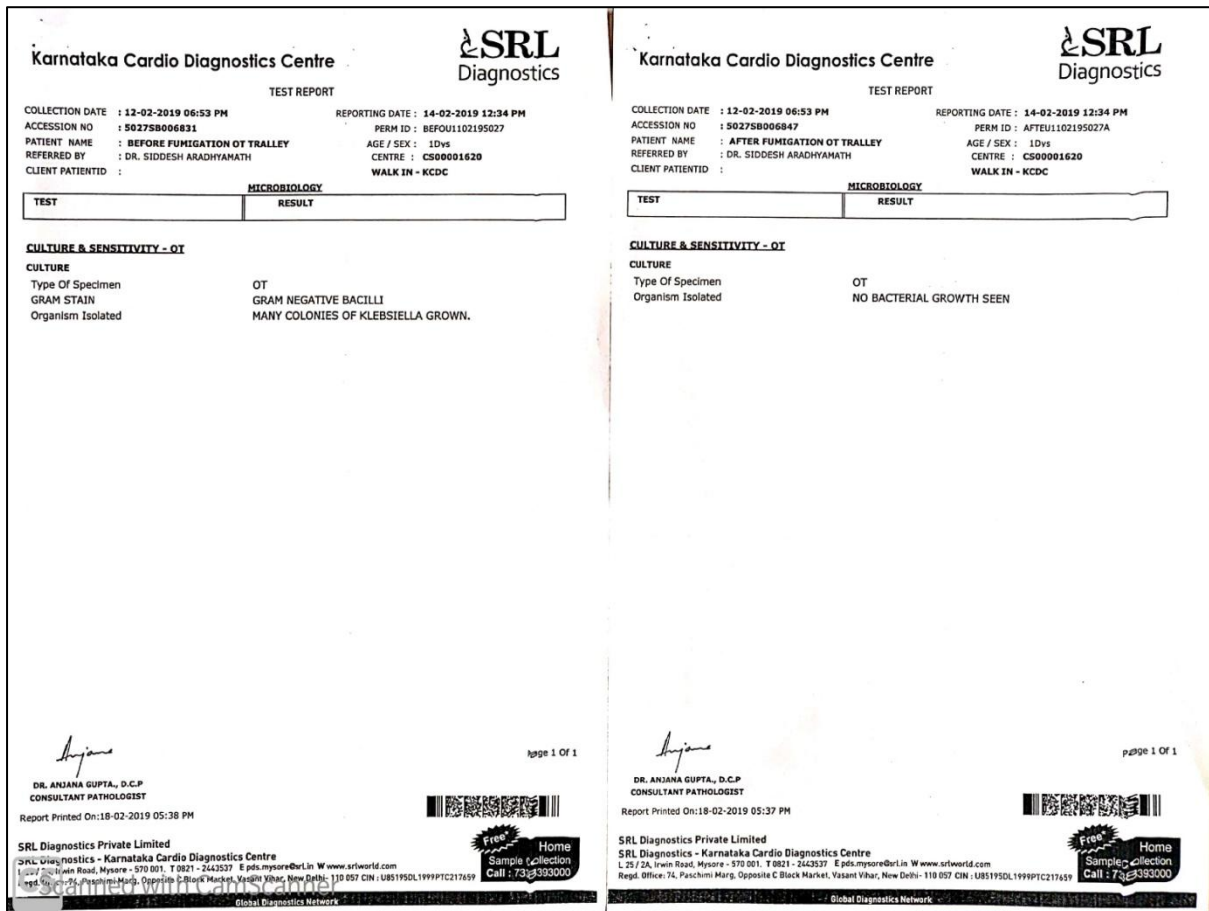
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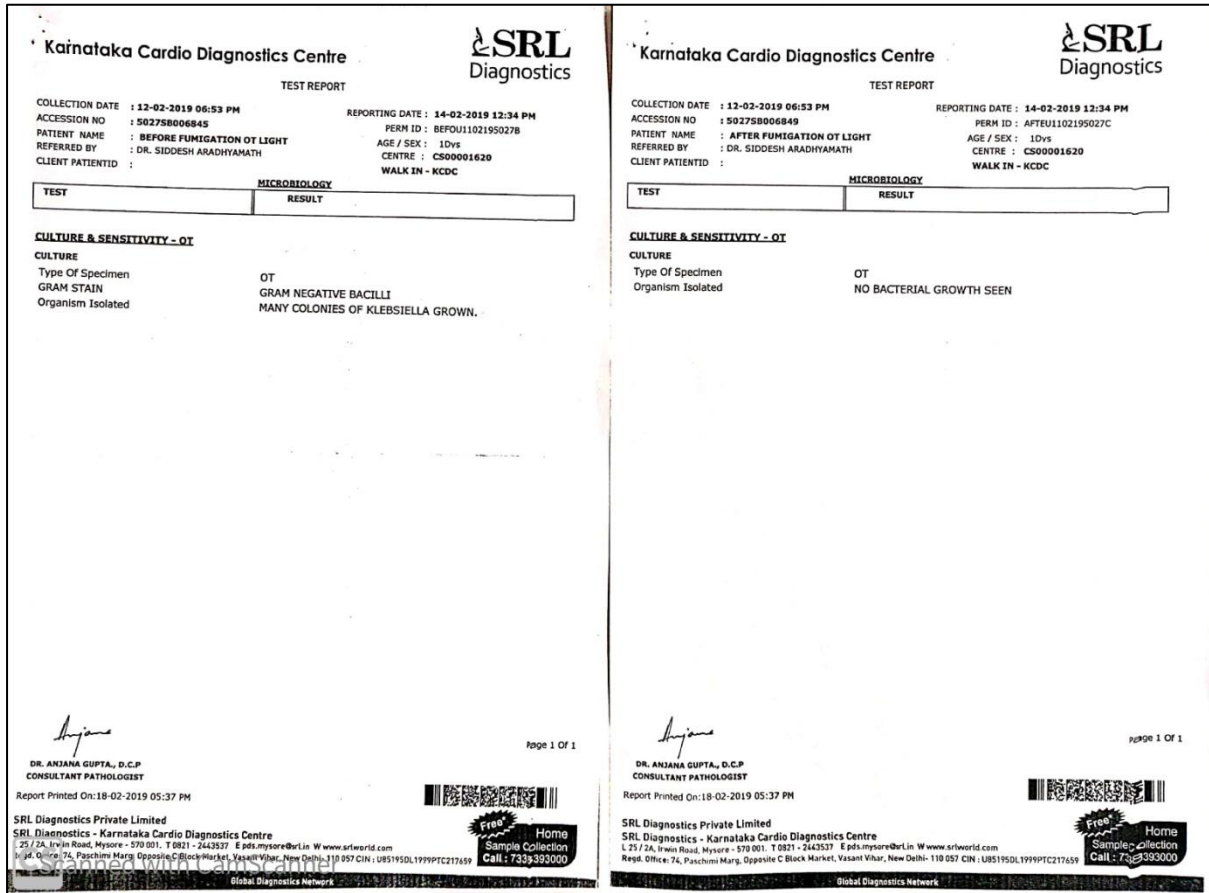
**Fig No 1: Before and After Fumigation swab culture and sensitivity reports of Minor OT Table**



**Fig No 2: Before and After Fumigation swab culture and sensitivity reports of Minor OT Trolley**



**Fig No 3: Before and After Fumigation swab culture and sensitivity reports of Minor OT Light**



**Fig No 4: Before and After Fumigation swab culture and sensitivity reports of Minor OT Wall**

