



# Assessment of Bacterial Spores and Its Related Skin Problems and to Evaluate the Effectiveness of Education Booklet on Usage of Household Washing Machine among Women's at Selected Area

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## Authors' contributions

This work was carried out in collaboration between both authors. Author GB designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author AD managed the literature searches and analyses of the study. Both authors read and approved the final manuscript.

## Article Information

### Editor(s):

(1) Dr. Giuseppe Murdaca, Di. M. I.-University of Genova, Italy.

### Reviewers:

(1) Mu Mu Han, Myanmar Maritime University, Myanmar.

(2) Dhani Redhono, Sebelas Maret University, Indonesia.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/64297>

Original Research Article

Received 10 November 2020

Accepted 16 January 2021

Published 05 February 2021

## ABSTRACT

**Introduction:** Skin disorders are the most common health problems among all age group people. Skin disorders may cause emotional and psychological stress for family members but certain factors which predisposes to skin problems include personal hygiene, type of washing technique, family history of skin infections, traditional taboos etc. Bacteria enters the household washing machine via worn clothes, household linen and influent water, while the laundry process is expected to deliver both visually and hygienically clean laundry.

**Aim:** The present study aims to assess the skin problems and evaluate the effectiveness of education booklet on usage of household washing machine.

**Methodology:** One group pre test and post test design was conducted among 60 women s. a random purposive sampling technique was used to select samples. Self administered structured

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questionnaires were used to collect demographic data and skin problems were assessed by using DLQI scale. Bacterial count in washing machine were assessed with swaps test. Self administered structured questionnaires were used to assess the knowledge on usage of household washing machine. The help of education booklet on usage of household washing machine were taught to women. And after teaching about usage of household washing machine knowledge level were re-assessed.

**Results:** The present study also shows that the demographic variable age, religion, education status, occupation, income, type of washing technique, duration of using washing machine, family history of skin infections, previous skin infection had shown statistically significant association with the post test level of knowledge on usage of household washing machine among women at  $p < 0.001$  level.

**Conclusion:** The study concluded that the women knowledge level increased after educating with education booklet and also an effective method to prevent further complications that can be caused due to usage of house hold washing machine.

*Keywords: Skin problems; education booklet on usage of household washing machine; bacterial count; quantitative method.*

## 1. INTRODUCTION

Skin disorders affect 20-30% of general population in the world. Socio demographic factors play a vital role in determining the pattern of skin disease [1]. The surviving bacteria build up biofilms in the washing machine and have higher resistance toward the used detergents. Modern machines often contain numerous plastic parts, which is ideal for adhesion and development of biofilms [2] washing machine biofilms are shown to harbor many possible human pathogens like *Pseudomonas aeruginosa* and *klebsiella pneumoniae*, sometimes even considerably more than toilets [3]. Bacteria enters the household washing via worn clothing, household linen and influent water, while the laundry process is expected to deliver both visually and hygienically clean laundry [4].

The evidence presented in the 2009 IFH (international scientific form on home hygiene) review on global burden of hygiene –related diseases shows that infections outbreaks in the home and everyday life settings ,particularly gastrointestinal (GI) infections , respiratory infections (RT) and skin infections , continue to exact a heavy toll on the health and prosperity of the global community [5].

Clothing and household linens (sheets, pillows and towels etc) have the potential to act as vehicles for spread of infection in home and everyday life settings. This can occur where family members, or others, share bed linen or share towels ( not only in home but elsewhere e.g. in sports changing rooms ) clothes have the potential, just as any other hand contact site, to

be a component in the chain of infection transmission during normal daily activities . There are also additional points where clothing can spread infection [6].

The first is where contaminated items are handled before and during laundering. Secondly, if the laundry process fails to eliminate contamination, this can then be spread to other items in laundry load [7]. If laundry is left damp, this encourages microbial survival and there is the chance for growth of residual microorganisms , such that clothes can then become a source of microbes.

The surviving bacteria build up biofilms in the washing machine and have higher resistance toward the used detergents. Modern machines often contain numerous plastic parts, which is ideal for adhesion and development of biofilms [8] washing machine biofilms are shown to harbor many possible human pathogens like *Pseudomonas aeruginosa* and *klebsiella pneumoniae*, sometimes even considerably more than toilets. Next to the pathogen risks, they induce malodour in washing machines and freshly washed clothes. [9] In order to counteract the biofilm build up, most washing machine producers advice a maintenance wash , a monthly wash at high temperatures, preferably involving a bleaching agent.

The evidence presented in the 2009 IFH(international scientific form on home hygiene) review on global burden of hygiene – related diseases shows that infections outbreaks in the home and everyday life settings, particularly gastrointestinal (GI) infections,

respiratory infections (RT) and skin infections, continue to exact a heavy toll on the health and prosperity of the global community [10].

Some occupations are associated with a higher risk of developing occupational contact dermatitis than others, depending upon the nature of exposure in the workplace [11]. In 1996, a cross-contamination risk by household laundry was demonstrated following an investigation of an outbreak of S.aureus skin infections among families in Boston. A significantly higher prevalence of infection was found in families who used a community washing machines were found to be operating at a temperature of 50-60 degree C, which was considered inadequate for disinfection of laundry [12].

The researcher had come across many families were using household washing machine and this was motivated researcher to conduct this study.the researcher believes that education booklet teaching will increase the knowledge and thereby helping to reduce the infection risks associated with clothing and household linens such as towels, bed linen and so on. This includes epidemiological data and data from quantitative risk Modeling techniques assessing the link between laundry hygiene and infectious skin disease risk.

During my community health posting, the researchers conducted the survey, the many family history are shows having skin problem, due to poor hygiene practice of washing machine and they donot have the adequate knowldge of usage of washing machine. Despite the existing knowledge, the understanding of bacterial exchange in household washing remains inadequate. So, the research intrested to conduct the study on this field.

This study focused on assessing the skin problems, bacterial count and to educate the family members on household washing and bacterial exchange in clothes through educational booklet at selected area.

### 1.1 Objectives

1. To assess the skin problems on usage of household washing machine among women's.
2. To assess the bacterial count in washing machine.

3. Compare the pretest and post test level of knowledge about the usage of household washing machine among women's.
4. Determine the effectiveness of education booklet on usage of household washing machine among women's.
5. To finding the association between posttest level of knowledge on usage of household washing machine among women's and demographic variable.

## 2. METHODS AND MATERIALS

A qualitative approach with one group pre test and post test design was used to conduct the study in mathur village,Chennai. 60 samples were selected by using a random purposive sampling technique. The criteria for sample selection are those who using household washing machine, women s who were willing to participate, women who could read and write Tamil , those who present at the time of data collection. The exclusion for samples are not using household washing technique,those who were not able to read and write Tamil, those who were absent during data collection. Before commencing the data collection, authorized setting permission was obtained from the authorities of selected village .the data was collected for one week in the month of January 2020 from women using household washing machine. The demographic data was collected using self administered structured questionnaire for women and the skin problems was also assessed by using DLQI(dermatology life quality index). The knowledge on usage of household washing machine was assessed before educating the samples with education booklet among women. Then the usage of household washing machine were taught by using education booklet. After that the knowledge level was re-assessed among women. The bacterial count in washing machine was assessed.

### 2.1 Data Analysis and Statistical Methods

The collected data was tabulated and analyzed using frequency distribution and percentage distribution for the collected demographic variables, assessing skin problems , assessing effectiveness of education booklet, and at last the associated post test level of knowledge with demographic variables.the statistical method used is descriptive statistics.

### 3. RESULTS AND DISCUSSION

#### Section A

Table

Age Group	Frequency	Percentage
(25-30)years	20	33%
(31-35)years	13	22%
(36-40)years	13	22%
Above 40 years	14	23%
Total	60	100%

Frequency percentage distribution of demographic variables of usage of household washing machine among womens. Out of 60 samples 20 (33%) members were belongs to the age group (25-30 years), 13 ( 22%) members were belongs to the age group (31-35 years), 13(22%) members were belongs to the age group (36-40years), 14 (23%) members were belongs to the age group (above 40 years).

Regarding Religion 36(60%) members were Hindu, 22 (37%) members were christian, regarding educational status 30 (50%) members were primary education, regarding

occupation 27 (45%) members were self employed.

Regarding income 15 (25%) members were belongs to ( 10000-15000), 27 (45%)members were belongs to (15000-20000), 17 (28%) members were belongs to (20000 - 25000), regarding washing technique, out of 60 sample (100%) were belongs to machine washing. regarding duration of using washing machine 15 (25%) members were using washing machine for (one year), 14 (23%) members were using washing machine for (two years), 14 (23%) members were using washing machine for (three years ), 16 (27 %)members were using washing machine for ( more than five years ).

Regarding family history of skin infections 5 (8 %) members were having family history of skin infections, 55 (92 %) members were not having family history of skin infection.

Regarding previous skin infection 28 (47%) members were had rashes, 2 (3%) members were had psoriasis, 2 (3%) members were had urticaria, 28 (47 %) members were had itching.

Religion	Frequency	Percentage
Hindu	36	60%
Christian	22	37%
Other	2	3%
Total	60	100%

Income Level	Frequency	Percentage
10000-15000	15	25%
15000-20000	27	45%
20000-25000	28	28%

Duration of using washing machine	Frequency	Percentage
One year	15	25%
Two years	14	23%
Three years	14	23%
More than five years	16	27%

Previous skin infection	Frequency	Percentage
rashes	28	47%
psoriasis	2	3%
urtioaria	2	3%
itching	28	47%

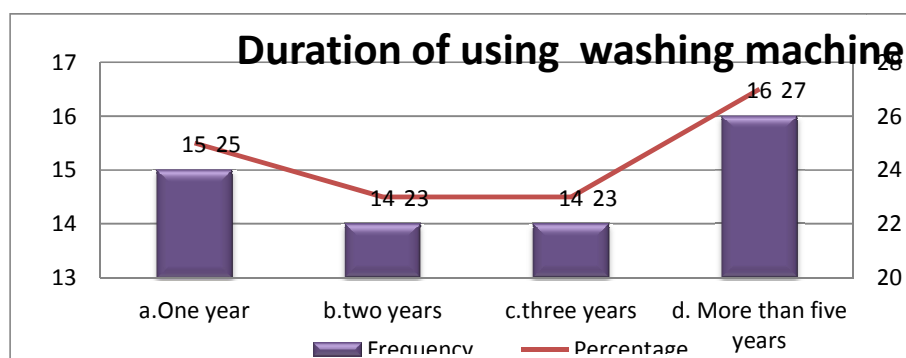


Fig. 1. Frequency and percentage distribution of demographic variable on duration of using washing machine of usage of household washing machine

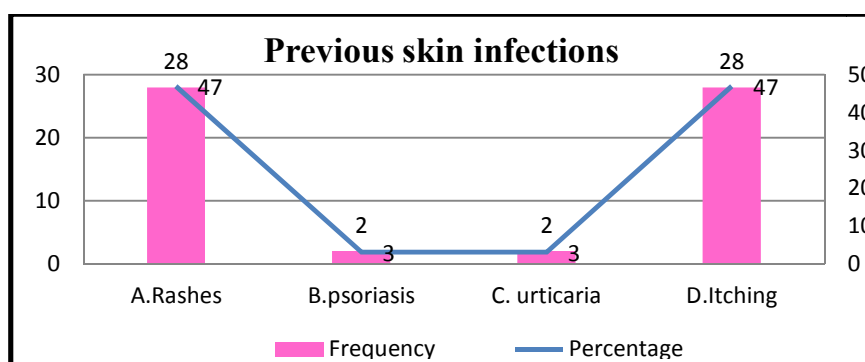


Fig. 2. Frequency and percentage distribution of demographic variable on previous skin infection of usage of household washing machine

**Section B. Frequency and percentage distribution of skin problems of usage of household washing machine among women.**

Distribution of level of knowledge on usage of house hold washing machine among womens. Regarding frequency and percentage distribution of pretest on knowledge usage of household washing machine . this data reveals that 5 (8.3%) had adequate knowledge, 7 (11.6

%) members had moderate knowledge , 48 ( 80 %) members had inadequate knowledge.

Regarding the frequency and percentage distribution of post test on knowledge usage of house hold washing machine among womens. This data revealed that 47 (78%) members had adequate knowledge , 13 (22%) members had moderate knowledge, 0 (0%) had inadequate knowledge.

**Table 1. Regarding the frequency and percentage of skin problem of usage of household washing machine among women. This data reveal that 17 (28 %)members were had no effect (skin problems ) at all in life, 19 (32 %) members were had small effect (skin problem) on life, 24 (40 %) members were had moderate effect (skin problems ) on life N=60**

S.NO	Level of skin problem	Frequency (N)	Percentage %
1.	No effect at all on patient's life	17	28.3 %
2.	Small effect on patient's life	19	32 %
3.	Moderate effect on patient's life	24	40 %

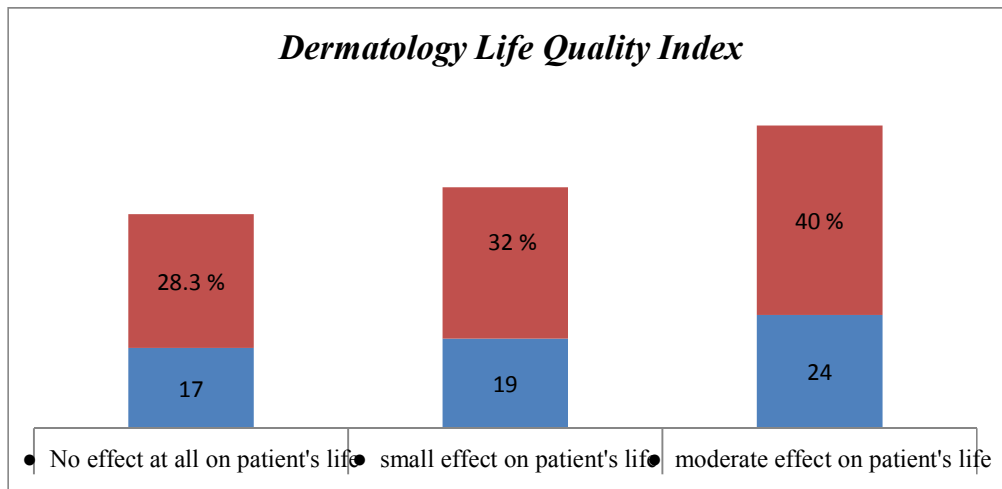


Fig. 3. Regarding the frequency and percentage of Quality of life on usage of household washing machine among women

Table 2. Frequency and Distribution of pretest and post test level of knowledge on usage of household washing machine among womens

Level of knowledge	Pre test		Post test	
	Frequency	Percentage	Frequency	Percentage
Adequate Knowledge	5	8.3 %	47	78.3%
Moderate Knowledge	7	11.6%	13	22%
Inadequate Knowledge	48	80 %	0	0%

**Section C: Effectiveness of education booklet on usage of household washing machine**

This data Reveals that ,the post test mean value is higher than pre - test.the paired 't' value found statistically significant and it shows that education booklet is effective in women were using household washing machine .

Education Booklet	Pre Test	Post Test	Paired 't' Test
Mean	5.233	52.533	5.736
Standard Deviation	0.7260	1.1822	S***

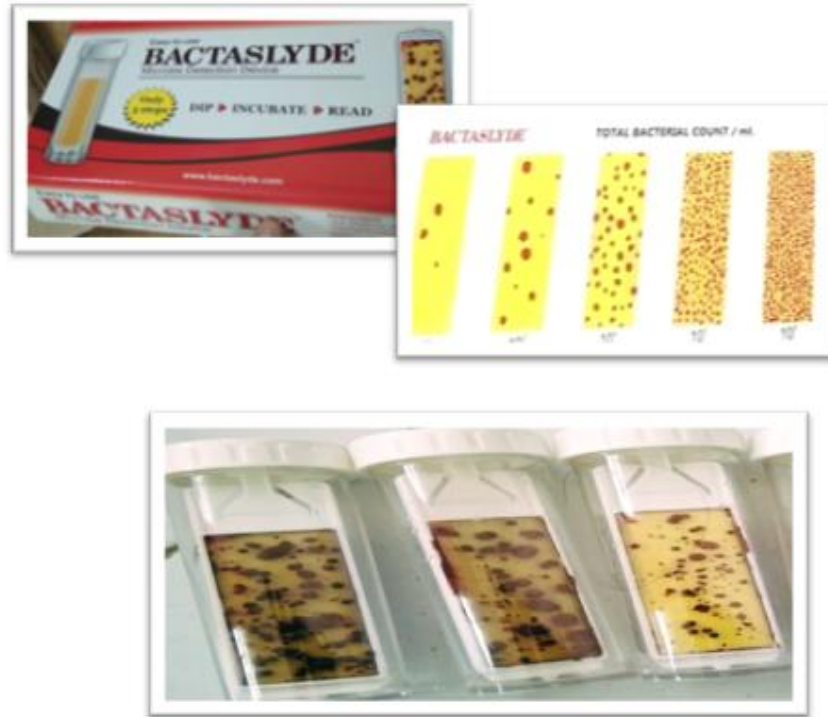
**Section D: Frequency and percentage distribution of bacteria growth in house hold washing machine**

Regarding the frequency and percentage of bacterial growth in household washing machine out of 60 samples 25 (41.6%)were had mild (100 - 1000 bacterial count /ml) , 31(51.6%)were had moderate ( 1001- 100000 bacterial count /ml ) , 4 (7%)were had severe (above 1 lakh bacterial growth count /ml ).

**4. DISCUSSION**

Bacteria enters the household washing via worn clothing, household linen and influent water, while the laundry process is expected to deliver both visually and hygienically clean laundry. In the past decades, laundry process and detergents were substantially adjusted for environmental and economic reasons. The introduction of enzymes and the concomitant lower washing temperature, a decreased water consumption and the use of liquid detergents without disinfecting bleaching agents are some of the main adaptations in the laundry process. These adjustments have impacted the hygienic quality of the laundry process. The present study shows that regarding washing technique out of 60 sample (100%) were belongs to machine washing ,regarding duration of using washing machine. 15 (25%) members were using

Level of Bacterial Growth	Frequency	Percentage
Mild	25	41.6%
Moderate	31	51.6%
Severe	4	7%



**Fig. 4. Distribution of bacteria growth in house hold washing machine**

washing machine for (one year), 14 (23 %) members were using washing machine for (two years ), 14 (23 %) members were using washing machine for (three years ), 16 (27 %)members were using washing machine for ( more than five years ), regarding family history of skin infections. 5 (8 %) members were having family history of skin infections.55 (92 %) members were not having family history of skin infection.,regarding previous skin infection. 28 (47 %) members were had rashes, 2 (3%) members were had psoriasis, 2 (3%)members were had urticaria , 28 (47 %) members were had itching. This present study was supported by the cross-sectional study conducted by Ursel Heudori et al., (2016).

The frequency and percentage of the skin problems of usage of household washing machine among womens . The present study shows that majority of them 17 (28%) members were had no effect (skin problems ) at all in sample life, 19 (32%) members were had small effect (skin problems) on life , 24 (40%) members were had moderate effect (skin problems) on life. The present study was supported by cross-sectional study conducted by Hilary Hungerford (2016) The global burden of disease (GBD) study 2010 estimate the GBD attributable to 15 categories of skin disease from

1019 to 2010 for 187 countries. For each of the following disease, the performed systematic literature review and analysis resulting data: eczema, psoriasis, acne vulgaris, prurities, Alopecia areta, ulcer, urticaria, scabies, fungal skin disease, impetigo, asepsis and other bacterial disease, Cellulitis, viral warts, Mollucsm contagious, and non malonoma skin cancer [3].

The frequency and percentage distribution of the bacterial growth on house hold washing machine, Self administered structured questionnaires were used to collect demographic data and skin problems were assessed by using DLQI scale [5]. Bacterial count in washing machine were assessed with the help of education booklet on usage of household washing machine were taught to women. The present study shows that out of 60 samples 25 (41.6%)were had mild (100 - 1000 bacterial count /ml) , 31(51.6%)were had moderate ( 1001- 100000 bacterial count /ml ), 4 (7%)were had severe (above 1 lakh bacterial growth count /ml ).The present study was supported by Chris Callewaert et al., (2015) Household washing machines (W Ms) launder soiled clothes and textiles, but do not sterilize them. We investigated the microbial exchange occurring in five household Washing Machines. Samples

from a new cotton T-shirt were laundered together with a normal laundry load. Analyses were performed on the influent water and the incoming cotton samples, as well as the Grey water and the washed cotton samples. The number of living bacteria was generally not lower in the Washing Machine effluent water as compared to the influent water. The laundering process caused a microbial exchange of influent water bacteria, skin-, and clothes-related bacteria and biofilm-related bacteria in the Washing Machine. A variety of bio film-producing bacteria were enriched in the effluent after laundering, although their presence in the cotton sample was low. Nearly all bacterial genera detected on the initial cotton sample were still present in the washed cotton samples. A selection for typical skin- and clothes-related microbial species occurred in the cotton samples after laundering. Accordingly, malodour-causing microbial species might be further distributed to other clothes. The bacteria on the incoming textiles contributed for a large part to the micro biome found in the textiles after laundering [13]

The frequency and percentage distribution of pre test and post test level of knowledge on usage of house hold washing machine. Despite the existing knowledge, the understanding of bacterial exchange in household washing remains inadequate . This study focused on assessing the skin problems and to educate the family members on household washing and bacterial exchange in clothes. Results Shows the frequency and percentage distribution of pretest on knowledge usage of household washing machine . this data reveals that 5 (8.3%) had adequate knowledge, 7 (11.6%) members had moderate knowledge , 48( 80%) members had inadequate knowledge. Results shows the frequency and percentage distribution of post test on knowledge usage of house hold washing machine among womens. This data revealed that 47 (78%) members had adequate knowledge, 13 (22%) members had moderate knowledge, 0 (0%) had inadequate knowledge. The present study was supported by the cross-sectional study conducted by Mary Coats (2014) Effectiveness of the educational program on laundry behaviour. Factor analysis was conducted with the data from the section on effectiveness of the educational program and revealed one factor with Cronbach's Alpha=0.95 with a variance of 87.97 extracted. Laundry behavior (pre-educational and post-educational surveys). This suggests that participants are doing less laundry. More participants reported

washing a piece of clothing after several wears (Mpre=0.48, Mpost=0.62,  $t=-2.73$ ,  $p<0.01$ ). This suggests that participants are wearing clothing more before washing. More participants reported washing a piece of clothing if it smells unclean (Mpre=0.46, Mpost=0.55,  $t=-2.10$ ,  $p<0.05$ ). This suggests that participants may be taking the time to check if their clothing is dirty before putting it in the laundry. Fewer participants reported washing a piece of clothing if there was visual dirt on it (Mpre=0.46, Mpost=0.30,  $t=-3.61$ ,  $p<0.001$ ). Hence the hypothesis is proved since There is a significant increase in the level of knowledge on usage of household washing machine among women's before and after intervention.

## 5. CONCLUSION

Usage of house hold washing machine was associated with age and using methods ,which demonstrates the needs to make target population aware of this bacterial growth as well as the etiological factors involved and way to prevent or control the infection spreading through local actions involving women and family members.

A change of cleaning and handing washing machine remains the best way of prevention of infection spread. Cleaning of washing machine should increases awareness that hot water cleaning reduces the spread of infection. Moisture and closed drum increases bacterial growth in it. Frequent cleaning of washing machine should be scheduled for prevent infections spreading through the washing machine. More preventive interventions that are targeted at women s are required to promote a healthy lifestyle .

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT

The investigator introduced and explained the purpose of the study to the sample and obtained the written consent.



## ETHICAL APPROVAL

It is not applicable.

## ACKNOWLEDGEMENT

We would like to extend our gratitude to the authorities of saveetha college of nursing, and to all the womens participated in study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Frontiers in Microbiology  
[www.frontiersin.org](http://www.frontiersin.org)

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Peer-review history:

The peer review history for this paper can be accessed here:  
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