

Evaluation on the efficacy of commonly used Prickly heat talcum powder against *Staphylococcus epidermidis* in *Miliaria rubra*

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Abstract:

Miliaria rubra is an acute inflammatory pruritic eruption of the skin, which is caused by the blockage of sweat glands and retained sweat, which is mainly managed by various prickly heat talcum powders. This study was carried to evaluate the efficacy of Prickly heat talcum powder in *Miliaria rubra* against *Staphylococcus epidermidis*. Six popular prickly heat talc samples were collected from the market and evaluated. All the prickly heat talc study results were encouraging and demonstrated efficacy against the test organism and are briefed in detail.

Keywords:

Miliaria, Prickly heat, *Staphylococcus epidermidis*, Powder, Sweat.

Introduction :

Skin rash also termed as sweat rash⁽¹⁾, heat rash or prickly heat. This is one of the common disorder of the sweat glands. Sweat retention rashes are likely to occur in hot and humid weather. The blockage of sweat ducts leads to Prickly heat. *Staphylococcus epidermidis* is one of the responsible organism for this disease⁽²⁾. This bacterium is harmless on the skin and make a sticky substance. This substance combined with excess sweat & dead skin cells cause blockage⁽³⁾ resulting in Prickly heat. *Staphylococcus epidermidis* strains which produce PAS Positive extracellular polysaccharide substance induce *Miliaria rubra*. It affects the infants and children due to their immature sweat glands. Though 4 forms are available only *Miliaria rubra* organism was selected and screened for this study. The organism leads to penetration of sweat into deeper layers of the epidermidis resulting in intense itching with a lack of sweating to affected area.

With the conventional treatment with topical antibiotics may shorten the duration of symptoms of *Miliaria rubra*. Anti-pruritic, anti-inflammatory & cooling agents are used in *Miliaria* treatment^(4,5). Prickly heat talcum powder provides good protection against *Miliaria*. It also smooth and soft to skin remains longer duration over the skin, and inhibits the bacteria and

absorbs sweat towards better control of *Miliaria*⁽⁶⁾. In the marketed products, Herbal Prickly heat powder contains herbal actives like Menthol, Vetiver, Ginger and Neem. Synthetic prickly heat talc contains chlorhexidine and boric acid. All these ingredients plays a pivotal role in the management of *Miliaria rubra*. To understand and establish the effectiveness of the Prickly heat talc widely used popular products were taken for this study and evaluated.

Materials and methods:

Six popular prickly heat talc products were selected for this study and evaluated for antimicrobial efficacy. The study products are categorized based upon the specialily ingredient present in it as per the label claim. Brand I contains Cetylpyridinum chloride, Zinc oxide, Brand II contains Maize starch, Boric acid, Vetiver, Menthol and Ginger oil. Brand III sample contains Jasat Bhasma, Amla and Cooling talc, Brand IV contains Yashada bhasma, Ushira and Nimba, Brand V contains Menthol, Camphor and Khuskhus and Brand VI contains Jasad Bhasma, Starch and Salicilic acid, respectively.

Staphylococcus epidermidis MTCC 435 were procured from IMTECH, Chandigarh, subcultured and stored in refrigerator. The cultures were further confirmed using Baird Parker agar with egg yolk supplement and also were subjected for biochemical tests which are positive for Catalase, Hydrogen sulphide, Voges Proskauer test and Gram staining and Negative for Citrate, Coagulase and Methyl red. Inoculating Nutrient broth media were procured from Himedia, Mumbai, India. Inoculum was adjusted to 0.5 MacFarland standard measuring 10^8 cfu/ml. MIC was determined at various increasing concentrations from 0.5 mg/ml upto 10 mg/ml, in a serial aliquots, with 10 ml of Muller Hinton agar. 100 μ l of the inoculum was inoculated on each plates. The plates were incubated for 24-48 hr at 35-37° C. Studies were carried out in triplicate and mean values are calculated and tabulated in Table 1.

Result:

The study results revealed a marked positive result against *Miliaria rubra* caused by *Staphylococcus epidermidis*. The results are demonstrated in Table 1.

Table:1 Minimum Inhibitory concentration for Prickly Heat Talcum powder samples

S.NO	Sample Details	Active ingredients	MIC (mg/ml)*
1.	Brand I	Cetylpyridinum chloride, Zinc oxide	20 mg/ml
2.	Brand II	Boric acid, Vetiver, Menthol, Ginger	10 mg/ml
3.	Brand III	Jasat Bhasma, Amla, Cooling talc	40mg/ml
4.	Brand IV	Yashada bhasma, Ushira,	40mg/ml

		Nimba	
5.	Brand V	Menthol, Camphor, Khuskhus	20mg/ml
6.	Brand VI	Jasad Bhasma, Starch, Salicylic acid	20mg/ml

*Results are mean of 3 values

Among the six tested samples Brand III and IV demonstrated MIC at a higher dose of 40 mg where as Brand I, V and VI demonstrated at 20mg and Brand II demonstrated at 10mg. The results clearly elucidated difference among the six products on its efficacy and Brand 4 was able to provide the same efficacy at a lower dose of 10 mg.ml, which is ideal for the sustained efficacy on the skin.

Discussion:

Miliaria rubra is a non-follicular, erythematous, papular eruption caused by extravasation of sweat into the skin, as a result of obstruction of the sweat ducts⁽⁷⁾. The keratinous & parakerotic plugs as well as the respective sweat retention vesicles may be seen in all forms of *Miliaria*. Sulzberger & Zimmerman hypothesized that excess sweating causes maceration of skin surface, faulty keratinization, occlusion of the sweat by horny plugs and irritation of the dermal layer by sweat. These altogether contribute to the production of *Miliaria*⁽⁸⁾.

The role of this resident organism has long been suspected as the leading predisposing factor in miliaria. High humidity and temperature associated with Miliaria, an expansion of resident bacteria is expected. This expansion occurs particularly in areas of partial occlusion because of apposition of skin to skin in body folds. Further Acton concluded that the initial major change is due to a Staphylococcal infection. Bansod *et. al.*, also investigated that antimicrobial compounds in human sweat are an important diagnostic and therapeutics for the treatment of skin diseases like *Miliaria*⁽⁹⁾. Use of topical steroids for the treatment of *Miliaria* is most recommended because of their anti inflammatory properties.

The current study clearly demonstrates that Brand II has highest antimicrobial activity compared to other samples. It has the composition of Maize starch, Talc, Zinc oxide, Boric acid, Herbal actives like Khus, Menthol, Ginger etc. Maize starch absorbs the sweat and keeps the skin free from sweat. Zinc oxide acts as a sunscreen agent. Menthol act as a natural cooling agent⁽¹⁰⁾. Khus is useful for burning sensation and as an antimicrobial agent⁽¹¹⁾. Ginger as an antimicrobial and provides instant relief⁽¹²⁾. The combination of the ingredients could be a cause for the better effect of the product among the tested samples. Brand I, V and VI was having 20 mg of inhibition due to the combined effect of the formulation and Brand III was much focusing on the cooling aspect of the product to the skin by cooling agents incorporated in the formulation.

Conclusion:

The study clearly demonstrates the efficacy of the Prickly heat talcum powder against *Miliaria rubra*, caused by *Staphylococcus epidermidis*. Brand II was very effective than other prickly heat talcum powder samples.

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