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Formulation and evaluation of povidone iodine liquid Anti-dandruff shampoo

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Abstract:

Medicated shampoos are recommended for the control and correction of dandruff. Today a number of medicated dandruff shampoos enjoy a reputation for appreciable effectiveness. The abnormal conditions of the scalp, by an increase in growth of bacteria and fungi, the predominating species being staphylococcus and pityrosporum ovale. Povidone iodine is an iodophor complex of iodine is continually delivered. The different concentration of dioctyl sodium sulfo succinate(20%),sodium lauryl sulphate (9%) along with(4%) of povidone iodine formulation were prepared and evaluated for foam, foam stability, cleaning action, wetting action, conditioning action,viscosity,microbial test, eye irritancy test, available iodine. the concentration rang of povidone iodine 66 ppm to 2500ppm kill the staphylococcus with in 15 -180 second.

Keyword: Povidone iodine, Dioctyl sulfo succinate, Sodium lauryl sulphate, Anti dandruff, Liquid shampoo.

Introduction

Povidone iodine is an iodophor, i.e.it is labile complex of iodine with the polyvinyl pyrollidone polymer, from which iodine is continually delivered. Only this free iodine has antimicrobial activity. in iodophors there is a complex relationship between the solution and the concentration of free iodine, so that e.g. through the dilution of a10% solution with a rate of 1:10 more free iodine is released from the complex and the anti microbial activity is increased.

Elemental iodine has very broad anti microbial spectrum against bacteria viruses. Bacterial endosperm fungi and protozoa's are destroyed through oxidative interaction and direct iodination of biological macromolecules. However, there have been reports of certain resistant germs.

Povidone iodine and their preparation are official in USP, European pharmacopoeia and are recognised as effective broad spectrum biocidal agent the invitro biocidal activity has been studied for years against bacteria, yeast, moulds, viruses, fungi, protozoa, actinomycetes and rickettsia.

There are also report stating that povidone iodine is an antiviral too, numerous invitro studies made over two decades indicate the efficiency of povidone iodine as a therapeutic agent for both human and animal.

Eleven product contain povidone iodine were tested for their ability to inactivate HIV virus in cell culture system. All of the products completely inactivated the virus at povidone iodine concentration greater than 0.5%.Usage of povidone iodine has significantly reduced the irritancy and toxicity with iodine use, and thus being used worldwide effectively.

Povidone iodine solution in water (or) alcohol is better tolerated than iodine solution. Povidone iodine is suitable for hand disinfection, surgical hand disinfection, burns, scalp condition, vaginal infection and throat infection and leg ulcers.

Material and Methods

Materials: Povidone iodine was gifted from ISP technologies inc.US, dioctyl sodium sulfosuccinate was obtained from Otto kemi, Mumbai, sodium laurayl sulphate was provided by Qualigens fine chemicals glaxo, Mumbai. All the other chemicals were used of analytical grade.

Methods:

Step 1 :(A) Required quantities of dioctyl sodium sulfosuccinate and glycerine are heated together in a water bath at 95^{o} C until a clear solution is formed.

(B) Sodium lauryl sulphate is dissolved in water and left overnight in a closed vessels.

Step 2: Both the above solution are mixed and accurately weighed amount of povidone iodine is added and mixed

slowly with gentle stirring to get uniform mixture. Finally perfume is incorporated.

Foam and foam s tability: The Ross-Miles foam column method used measure foam height and stability. In this test 200 ml of 0.1% liquid shampoo solution falls through an orifice into a glass column containing 500 cc of the same solution. After a specified period of time at once and after five minutes, the height of foam is measured.

Cleaning acti on: Cleansing power is evaluated by the method of barnet and powers, 5gm sample of soiled human hair is placed at 35^{o}c in 200 cc of water containing of 1 gm of shampoo. The flask is shaken 50 times a minute for 4 minutes. Then washed once again with sufficient amount of water, then after filter the hair dried and weighed. The amount of soil is removed under these condition is calculated.

Collection of hair: Uniform size of human hairs was collected. Then hairs washed with sufficient amount of water and dried.

The Accurate amount of hair (5g) soiled with standard soil then weighed. These hairs taken for cleaning action.

Preparation of standard soil:

Combination of carbon black and mineral oil.

Wetting action: Canvas disk sinking test: A mount veron cotton duck # 6 canvas disks 1 inch in diameter is floated on the surface of a solution, and the time required for it to sink is measured accurately.

Conditioning a ction: Conditioning action is a difficult property to assess. This is because it is basically dependent on subjective appraisal. No method has been published for measuring conditioning action. The degree of conditioning given to hair is ultimately judged by shampoo user who is making the evaluation on the basis of past experience, present expectations, and continuing change is the individual scalp and hair situation. Conditioned hair should be soft, lustrous, easily combined and coiffures.

Evaluation of cond itioning action: The prepared shampoo formulations were given to volunteers and they were asked to give their opinion, on the conditioning ability of preparation.

After two weeks volunteers were of the opinion that the shampoo gives the hair a lustrous look, softness and hair is easily styled.

Viscosity: Viscosity of the liquid shampoo was determined using a Brooke field (model-TVTP) spindle (No.4 type) at 20 rpm. 200 grams of the shampoo was taken in a beaker and the spindle was dipped in it for about 5 min and then the reading was taken.

Preparation of pre-inoculum: Take the loopful culture of staphylococcus aureus (ATCC6532) aseptically and transfer to sterilized and cooled 100 ml SCDM (broth).Mix well. Incubate the broth at 37^{o}C for 24 hrs.

Preparation of me dia: Soya bean casein digests medium, soya bean casein digest agar and nutrient agar.

Preparation of pour plates: Sterilised SCD agar (100 ml) is cooled to 40^{o}C and mixed with 5 ml of 24n hrs old pre inoculated culture. This is immediately poured in plates (340 ml each) and allows setting.

Making the wells on agar p lates: The wells are dig on agar plates with sterilised well digger aseptically. Take 100µml of each sample, add to well aseptically. Incubate the plates at 37^{o}C for 24 hrs to 48 hrs.Observe the effectiveness of sample on culture growing on the agar plate and we can see the effectiveness of sample in the form of zone of inhibition around each well containing different sample.

Eye irritancy test:

Procedure:

The test calls for dropping 0.1 ml of liquid shampoo the test substance in the conjunctiva sac of one eye of the rabbit, the other eye serving as control. In the case of the first three animals, the treated eye remains unwashed. Since washing the eye may or may not alleviate symptoms of

injury. The six remaining animals are divided into two equal groups in the first of these groups eyes instilled with the substances are washed with 20 ml of lukewarm water two seconds after treatment and in the second group after instillation. The washing is regarded as significant since it is important to know the effect of such a procedure that is, whether it is detrimental or beneficial and if beneficial, to ascertain the extent of the benefit of the made at 24, 48 and 72 hr and again four and seven days after treatment. If the lesions have not cleared up in seven days the test material is considered as severe irritant.

Available iodine: Weigh accurately about 5 gm of Povidone Iodine liquid shampoo into a round bottom stoppered Iodine flask containing 150 ml of water and stir for 1 hour. Add 0.1 ml of dilute acetic acid and titrate against 0.1M sodium thiosulphate using starch solution as indicator towards the end. Each ml of 0.1M sodium thiosulphate is equivalent to 0.01269 gm.

$$= \frac{Titre\ volume \times Molarity\ Factor \times Equivalent\ weight\ factor}{Weight\ taken\ in\ gram\ (Sample)} \times 100$$

= % gm of available Iodine.

100gm of Povidone Iodine contain 11.9 gm of available `Iodine, 4% of Povidione Iodine shampoo contain 0.476 % of available Iodine.

Results and Discussion

Povidone Iodine liquid shampoo formulations were evaluated for foam stability, cleaning action, wetting action, microbial test and eye irritancy test.

Reputed marketed preparations (Brand 1, 2, 3) were used as reference standard during evaluation of the prepared shampoos. The findings of the evaluation are discussed separately for the developed liquid shampoo.

Foam and foam stability:

The liquid shampoo formulation is found to have better foam stability than brand-

Foam and foam stability:

Foam height	Brand-1	Brand-2	Brand-3	Sample
Soft water initially(cm)	3.4	4	3.7	4.1
Soft water after 5min(cm)	3.4	3.9	3.6	4.1
Hard water initially(cm)	3.2	3.7	3.5	3.9
Hard water after 5min(cm)	3.2	3.6	3.4	3.8

1and 3,slightly more than brand-2.the foam stability of the preparation decreases in hard water as in case of the standard preparation preparation. so it can be concluded on the basis of the above result that the formulation has good foam stability, that is comparable to standard market preparation.

Cleaning action:

Cleaning action:

Water	Brand-1	Brand-2	Brand-3	Sample
Soft water (%)	81.43	95.81	88.62	98.2
Hard water (%)	78.2	89.65	84.32	93.12

Cleaning action of the formulation is found to be better in comparison to brand 1,2 and 3.the cleaning action shows a marked decrease in hard water but so in the case with other marketed preparation. All the above results lead us to a conclusion that the formulation has good cleaning action in comparison with the marketed products.

Wetting acti on: Wetting action of the liquid shampoo preparation is found to be better than 1, 2 and 3.this indicates that the preparation is likely to have better wetting action and thus expected to have a better cleaning action, than marketed formulations.

Wetting action	Brand-1	Brand-2	Brand-3	Sample
Time in (sec)	531	503	517	482

Anti microbial activity:

	Brand-1	Brand-2	Brand-3	Sample
Zone of inhibition (mm)	3	5	6	5

The anti microbial activity of the shampoo formulation were evaluated following the standard procedures for microbial evalution.it was found that the antimicrobial activity of the preparation is equal to brand 2 activity and slightly less than brand 3.

Based on the above observations. it is expected that the prepared shampoo will have similar anti microbial action, as compared to the marketed formulation.

Viscosity:

Viscosity:

Formulation	F1	F2	F3	F4	F5	F6	F7
Viscosity in(cps)	2098	2101	2112	2080	2100	2295	2300

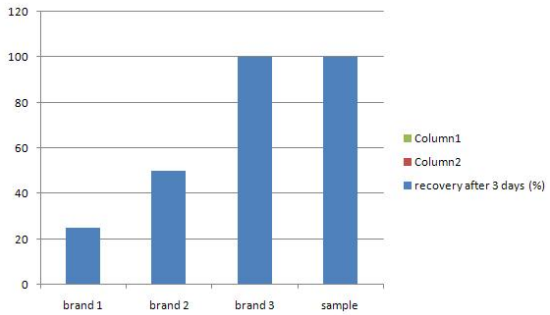
Available iodine:

There is no significant change in available iodine content in all the formulation.

Formulation	% of available Iodine
F-1	98.3
F-2	98.5
F-3	98.7
F-4	98.6
F-5	98.6
F-6	98.7
F-7	98.7

Eye irritancy test:

There was slight irritation on application of preparation. The animal recovered well within 3 days as the case with brand 3.



Summary and conclusion:

Povidone iodine is a proven broad spectrum anti bacterial agent. Since no shampoo formulation is available in Indian market, my aim was to formulate a stable formulation.

Clear liquid shampoo formulations were prepared and evaluated. It was found the preparations are having good antidandruff activity which is comparable to any marketed medicated shampoo. the preparation were found to stable and were having good properties such as anti dandruff, foam stability, cleaning action, wetting action, conditioning action, it does not have any irritancy also.

Since the shampoo preparations were elegant and stable, my aim to formulate a good shampoo preparation was achieved.

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