



Resident's Page

Calamine lotion

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ABSTRACT

Calamine lotion is a shake lotion composed of calamine (zinc oxide/carbonate and ferric oxide), zinc oxide, bentonite, glycerine, sodium citrate, and liquified phenol. It is used widely in dermatology as a soothing agent. It is a preferred topical therapeutic agent for children including infants and is considered safe in pregnancy and lactation.

Keywords: Calamine lotion, Shake lotion, Zinc oxide

INTRODUCTION

Calamine lotion comes under the category of shake lotions and contains calamine and zinc oxide as active ingredients.^[1] In addition, it also contains bentonite, glycerine, sodium citrate, and liquified phenol.^[2]

This article focuses on calamine lotion and preparations that contain calamine lotion. The topical preparations that contain zinc oxide or calamine alone (instead of calamine lotion as a whole) are not discussed here.

Simple suspensions or solutions of medication in water, alcohol, or other liquids are called lotions.^[3] When left on the skin, the lotion will leave a film of medication on skin surface, as the liquid portion evaporates.^[3]

Shake lotion is an aqueous suspension of powders. Hence, such lotions require shaking before each application.^[3] The United States of America Food and Drug Administration (US FDA) has approved calamine lotion as an over-the-counter medication that can serve as a skin protectant.^[1] Calamine lotion is included as an anti-inflammatory and antipruritic medicine in the World Health Organization's list of essential medicines, under the category of dermatological medicines (topical).^[4]

It is recommended that all shake lotions should be dispensed in wide neck bottles so that a small paint or varnish brush (with which the lotion is applied to the skin) can be directly inserted into the bottle.^[2]

There are some differences in the ingredients of calamine lotion as mentioned in British Pharmacopoeia (BP) and the United States Pharmacopoeia (USP).^[2]

The difference starts from the constituents of calamine itself. As per BP, calamine is basic zinc carbonate colored with ferric oxide. Calamine according to the USP is zinc oxide colored with ferric oxide.^[2]

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The differences in the composition of calamine lotion by BP and USP are shown in Table 1.^[2]

A comparison of BP and USP concerning calamine lotion shows that the powder proportion is slightly higher in BP. According to the BP, bentonite is added to the powders before the addition of water. Calamine lotion, as per BP, has sodium citrate as an ingredient while USP formulation does not include sodium citrate. The BP-directed preparation of calamine lotion is simpler than the same by the USP. The USP necessitates the preparation of bentonite magma. BP allows the preparation of a thixotropic suspension (a suspension that is a gel at rest and becomes liquid on stirring). Moreover, the USP distinguishes between a bland and a phenolic calamine lotion. Liquified phenol is a constituent of calamine lotion as per BP. Due to the presence of phenol, the BP formulation of calamine lotion cannot be considered as a bland vehicle. Calamine lotion of the USP formulation does not contain liquified phenol and qualifies as bland calamine lotion. The USP also mentions the preparation of a phenolic calamine lotion which is constituted by the addition of 1 ml liquified phenol to 99 ml of calamine lotion.^[2]

Oily calamine lotion as formulated by BP (calamine 5, oleic acid 0.5, wool fat 1, arachis oil 50, and calcium hydroxide solution add to 100) causes less drying.^[2]

PHARMACOLOGICAL ACTION OF INDIVIDUAL INGREDIENT OF CALAMINE LOTION

1. Calamine: It may be either zinc carbonate or zinc oxide (98%), colored pale pink with ferric oxide (2%), and has bland, soothing, and antipruritic properties.^[2]
Zinc oxide: It is an inorganic powder with cooling and slightly astringent properties. It has soothing and protective properties. It can block broad-spectrum sunlight (ultraviolet B and A and visible light). Hence, it is preferred as an inexpensive physical sunscreen. Ann *et al.* reported that zinc oxide exhibited bactericidal action on *Staphylococcus aureus* and *Pseudomonas aeruginosa*. The antibacterial property was attributed to the structural morphology of zinc oxide that induced toxicity and a killing effect on bacteria.^[2,5-7]

Table 1: Ingredients of calamine lotion according to the British Pharmacopoeia and the United States Pharmacopoeia.

British Pharmacopoeia	United States Pharmacopoeia
Calamine 15 g	Calamine 8 g
Zinc oxide 5 g	Zinc oxide 8 g
Bentonite 3 g	Glycerin 2 ml
Sodium citrate 0.5 g	Bentonite magma 25 ml
Liquified phenol 0.5 ml	Calcium hydroxide solution add to 100 ml
Glycerine 5 ml	ml
Water add to 100 ml	

2. Bentonite: Bentonite is colloidal hydrated aluminium silicate. Bentonite serves as a stabilizer in shake lotions.^[2,6]
3. Glycerine: Glycerine is a humectant, emollient, and stabilizer.^[8]
4. Sodium citrate: Sodium citrate controls the pH of the lotion.^[9]
5. Liquified phenol: It acts as a preservative, alleviates itching (through its anesthetic effect), and acts as an antiseptic.^[6,8]

ADVANTAGES OF CALAMINE LOTION

- When applied to the skin, the aqueous component of calamine lotion evaporates. The heat required for evaporation is taken from the body which gives a cooling effect at the site of application. This provides the lotion its soothing and antipruritic effect.^[5,8]
- The powder added to the lotion increases the surface area of evaporation. As a result, the lotion effectively dries and cools wet and weeping skin.^[8]
- It is suitable for application to large surface areas due to its ability to spread easily and uniformly.^[5]
- Calamine lotion allows passage of some amount of secretion and exudation.^[5]
- It is considered safe in pregnancy and lactation since it has been in use for centuries and has not been reported to cause any adverse outcomes in pregnancy or lactation. However, there is a lack of data from studies.^[5,8] However, phenol containing preparation is to be avoided in pregnant women.^[10]
- It is often the favorite preparation in treating children and considered safe in infants.^[5,8] However, phenol containing preparation is to be avoided in infants.^[10]
- By the addition of specific ingredients, the lotion can be made more effective in the management of different dermatoses.^[5]

DISADVANTAGES

- A drying effect on skin.^[5,8]
- Some patients and some body areas (calamine lotion becomes gritty in moist, intertriginous areas) do not tolerate the lotion.^[5]
- The powder component may clump together and become abrasive after evaporation of water, and hence, patients should be instructed to remove the residual particles before reapplication.^[8]
- The pink color may be cosmetically unacceptable for daytime use, especially on exposed skin.
- Calamine lotion produces only a superficial effect since it does not penetrate to deeper layers of skin, which makes it less effective as a treatment modality.^[5]
- Calamine lotion is considered safe in pregnancy and lactation. However, the safety of the modified preparations

in pregnancy, lactation, infants, and children has to be reassessed based on the added ingredients.^[5,8] In infants, resorcinol-containing preparations should not be applied to more than one-fourth of the body surface.^[5] Menthol, when combined with camphor in a topical preparation, is pregnancy category C (US FDA).^[10] As already mentioned, phenol-containing preparation is to be avoided in pregnant women and infants (US FDA).^[10]

- A shake lotion has less chance of getting absorbed systemically; but care must be taken when calamine lotion with added ingredients such as resorcinol, tars, anthralin, phenolic substances, or benzocaine is applied to large areas of the body or periorificial regions or when used in children.^[5]
- Like all other shake lotions, calamine lotion also develops sediment that cakes at the bottom of the container. After some time, it becomes impossible to disperse the sediment by shaking the container. A properly prepared shake lotion lasts longer than its poorly made counterpart.^[2]
- Suen *et al.* had reported a case where the calamine lotion applied by the patient mimicked intramammary calcifications on the mammogram.^[11]

CALAMINE LOTION WITH ADDED INGREDIENTS

Menthol or camphor or diphenhydramine, when added to calamine lotion, can potentiate the antipruritic action of the lotion.^[5,8] Menthol is a cyclic terpene alcohol that induces a cooling sensation and relieves pruritus.^[1,5,8] Menthol reduces itching, through its action on cold receptors and/or nerve fibers.^[8] Diphenhydramine is an H1 (histamine receptor 1) antagonist with a localized anesthetic effect by blockage of sodium channels.^[8]

Table 2 shows preparations of calamine lotion with added ingredients.^[5]

USES IN DERMATOLOGY

Calamine lotion is found useful in many conditions due to its soothing and antipruritic actions. The addition of specific ingredients can render it antiparasitic, antifungal, and keratolytic effects [Table 2].^[5,12] The following are dermatoses in which calamine lotion is found useful:

1. Acute or subacute, less edematous, and less inflamed dermatoses or eczema [Table 2].
2. Dermatitis or eczema complicated by fungi (calamine lotion containing resorcinol).
3. Eruptions of herpes zoster and drug eruptions (calamine lotion acts as a soothing agent).
4. Crusted and excoriated stage of dermatitis herpetiformis [Table 2].
5. Lichen planus: Calamine lotion or its modifications with antipruritic action [Table 2] are useful to relieve pruritus associated with lichen planus.

Table 2: Modified preparations of calamine lotion.

Composition	Use
1. Menthol 1 Calamine lotion add to 100	Antipruritic action
2. Menthol 0.3–0.6 Solution of coal tar (liquor carbonis detergens) 3.6–6 Chloral hydrate 3.5 Calamine lotion USP add to 120	Antipruritic action
3. Menthol 0.3–0.6 Phenol 0.3–0.6 Liquor carbonis detergens 6–12 *Benzocaine 6–12 Calamine lotion USP add to 120 (Resorcinol/salicylic acid 1–2% or camphor 2–4% may be added)	Antipruritic action
4. Menthol 0.15–0.6 Phenol 0.15–0.3 Resorcinol 1.2–3.6 Liquor carbonis detergens 2.4–6 Calamine lotion USP add to 120	Mildly parasiticidal, soothing and drying, anti-eczematous preparation
5. Menthol 0.3–0.6 Phenol 0.3 Resorcinol 2.4–7.2 Calamine lotion USP add to 120	Intertrigo due to fungus
6. Benzyl benzoate emulsion 50 Calamine lotion 50	Anti-scabietic with reduced potential to cause skin irritation in comparison to benzyl benzoate emulsion
7. Menthol 0.15–1.2 Phenol 0.15–0.6 Liquor carbonis detergens 3.6–12 Camphor 2.4 Calamine lotion USP add to 120	Crusted and excoriated stage of dermatitis herpetiformis

*Benzocaine may cause sensitization; USP: United States Pharmacopoeia

6. Pityriasis rosea: Calamine lotion or a simple modification of the same containing menthol and phenol may alleviate the pruritus of pityriasis rosea [Table 2]. The addition of 3–5% of solution of coal tar may improve the antipruritic effect and 1–3% of resorcinol may accelerate the desquamation of the rash.^[5]
7. Sunburn.
8. Miliaria, urticaria, insect bites, and stings (calamine lotion provides antipruritic and soothing effects).^[12]
9. Acne vulgaris and other acneiform dermatoses [Table 2].
10. Physical sunscreen (calamine lotion can act as a sunscreen since it contains zinc oxide).^[12]

CONCLUSION

FDA considers calamine lotion as a skin protectant. The addition of specific ingredients can potentiate its antipruritic action or can impart it keratolytic or antiparasitic or antifungal properties.

Declaration of patient consent

Not required as there are no patients in this article.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Available from: <https://www.fda.report/dailymed/40a868a8-84a5-4c61-bf00-2b3477578c2e>. [Last accessed on 2021 Dec 24].
2. Polano MK, August PJ. Topical Skin Therapeutics. Edinburgh: Churchill Livingstone; 1984.
3. Jones JB. Principles of topical therapy. In: Griffiths CE, Barker J, Bleiker T, Chalmers R, Creamer D, editors. Rook's Textbook of Dermatology. 9th ed. Oxford: Wiley Blackwell; 2016. p. 18.1-39.
4. World Health Organization Model List of Essential Medicines-22nd List, (WHO/MHP/HPS/EML/2021.02). Geneva: World Health Organization; 2021.
5. Sulzberger MB, Wolf J, Witten VH, Kopf AW. Dermatology diagnosis and treatment. 2nd edition. New York: The Year Book Publishers Inc.; 1961.
6. Solanki H, Verma VS, Sharma M, Singh A, Sharma G, Majumdar M, *et al*. Natural humectants in the formulation of calamine lotion: Its evaluation and comparison. Res J Top Cosmet Sci 2016;7:41-5.
7. Ann LC, Mahmud S, Bakhori SK, Sirelkhatim A, Mohamad D, Hasan H, *et al*. Structural morphology of zinc oxide structures with antibacterial application of calamine lotion. AIP Conf Proc 2015;1657:100012.
8. Souza AD, Strober BE. Principles of topical therapy. In: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 8th ed., Vol. 214. New York: McGraw Hill; 2012. p. 2643-51.
9. Available from: <https://www.drugs.com/inactive/sodium-citrate-131.html>. [Last accessed on 2021 Dec 24].
10. Burkhart CN, Katz KA. Other topical medications. In: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 8th ed., Vol. 222. New York: McGraw Hill; 2012. p. 2697-707.
11. Suen KC, Ho L, Chow KL, Wong LL, Leong L. Calamine lotion: Mimicking intramammary calcifications. Australas Radiol 2007;51:B43-4.
12. Dixit S, Jain A, Datar S, Khurana VK. Congenital miliaria crystallina-a diagnostic dilemma. Med J Armed Forces India 2012;68:386-8.

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