

Formulation and Evaluation of Skin Cream for Psoriasis and Fungal Infection

Vruti A Ratanpara⁽¹⁾, Krina S Patoliya⁽²⁾, Sneha J Patel⁽³⁾, Varshit K Parmar^{(4)*}

A-ONE PHARMACY COLLEGE, SNME Campus, S.P Ring Road, Village: Enasan, District: Ahmedabad-382330⁽¹⁾⁽²⁾⁽³⁾

B. Pharm, Shree Swaminarayan Sanskar Pharmacy College, Gandhinagar, Gujarat, India ^{(4)*}

Abstract-Even in places where access to modern medicine is available, there has been a substantial increase in interest in and usage of herbal remedies in recent years. Plant-derived substances and herbal medicines have been attracting a lot of attention because medicinal plants are the primary source of the bioactive molecules utilized in modern as well as traditional medicine. The current task is to create a cream that contains Salicylic acid, Sulphur and Neem powder. The basis for the cream was made, then the water and oil phases were combined to make the cream. It was assessed for its physicochemical properties, including color, odor, pH, texture, and stability, after formulation. Consequently, it might use the medical property in the media.

Key Words: Skin Cream, Sulphur, Salicylic acid, Neem, Oil and Water phase

INTRODUCTION

Almost every aesthetic condition may now be addressed with a wide variety of skincare products, including body washes, gels, lotions, exfoliants, moisturisers, toners, and sunblock. The focus is primarily on internal skin improvement. The FDA's existence limits the use of recognised dangerous compounds, even though many skincare products still have side effects. For a very long time, creams and other topical preparations have been considered fundamental parts of cosmetics. Creams may be regarded as pharmaceutical items since even cosmetic creams are founded on pharmacy principles and unmedicated creams are frequently utilised in a variety of skin problems. In the past, making creams was as simple as mixing two or more components together while using water as the solvent. ⁽⁴⁾

Newer formulation techniques for creams are adopted as a result of technological improvement. The general

public and society can employ these semisolid preparations in an elegant way. Their range of capabilities is impressive. Creams are easily applied to any area of the body. All age groups find cream to be convenient to use. Although it might work just as well on non-aqueous cosmetics like ointments, liquid eye makeup, and mascaras with wax-solvent bases. An emulsion is referred to be lotion if it has a low enough viscosity to be poured (flow under the effect of gravity alone). Emulsions of water and oil make up creams. In the near future, cream preparation, formulation, and evaluation will be done using increasingly sophisticated technology and methodologies. Additionally, the demand for creams made with natural ingredients is growing every day. ⁽⁴⁾

Advantages

- less chance of adverse effects.
- extensive accessibility.
- greater chemical stability compared to liquid dose formulations.
- extend the period of time when the medication is in contact with the affected area.
- much less oily than ointment.

Disadvantages

- a less viscous preparation compared to other semi-solid ones.
- hepatic metabolism, with poor stability in increasing acidic PH.
- less stable than dose forms in a solid state.

LITERATURE REVIEW

Tushar N. Sonawane, Dhananjay D. Chaudhari, Azam Z. Shaikh (2021). This research paper consists of "A short review on skin care creams". The term "cream"

refers to a thick liquid or semisolid emulsion that is used to inject a medicine into the skin or mucous membrane of the skin. And also, for the various skin diseases. The creams were then researched because they were created using technologies from the pharmaceutical sector and are a pharmaceutical product. They could be herbal, ayurvedic, or allopathic, as well as medicated or non-medicated. Skin reflects one's ancestry, way of life, age, and level of health. The two main categories for skin creams are O/W and W/O. Then an emulsifying agent will emulsify them. Numerous vitamins, including synthetic versions of vitamins A, E, and D3 and fatty acids (EFA), are utilised in skin creams. It also makes use of water, oil, fat, waxes, dyes, glycol, and other materials. While creams have many benefits—such as being simple to use, more risk-avoidant than other forms of medication, complete drug absorption—they also have some drawbacks, including the potential for skin irritants brought on by adjuvants and the imperfect absorption of large-sized medications. ⁽²⁾

Shalini Gupta, Lalita Chauhan (October 2020). This research paper consists of “Creams: A review on classification, Preparation Methods, Evaluation and its Application”. Because they are so easy to apply and remove from the skin, creams have been regarded as fundamental topical preparations in cosmetic items from the dawn of time. Pharmaceutical creams are used for a variety of medical and cosmetic reasons, such as defending skin against bacterial and fungal infections, treating burns, cuts, and wounds, as well as cleansing, beautifying, changing appearance, moisturising, etc. The general population and society can safely employ these semi-solid preparations. Although human skin is often damaged, it is also capable of self-healing. Infection risk exists, particularly in the initial stages of damage, and the process of mending naturally can take some time. In these circumstances, medicinal creams can be administered to the injured site to hasten healing and guard against infection. In this review, we concentrated on the use of topical drug delivery systems, i.e., pharmaceutical creams, for wound healing after a thorough discussion of the wound healing process, suitable methods of cream preparation, their classification based on function, their benefits and drawbacks, characteristics and the various types of creams, ingredients used in the

formulation of creams, and their various evaluation parameters. ⁽³⁾

Mohiuddin Ak (4th June, 2019). This research paper consists of “Skin care creams: Formulation and use”. Skin tone is an indicator of origin, lifestyle, age, and health. Skin surface characteristics including colour, tone, evenness, and pigmentation are signs of skin health. A wide range of skin care products and treatments are offered by the cosmetic and pharmaceutical sectors to keep our skin in "good condition" by sanitising, soothing, regenerating, fortifying, shielding, and healing it. Skin care products are widely accessible in daily life and are important in nursing and health care. Cleansing, relaxing, repairing, strengthening, and protecting are now all included in modern skin care. Skin care has evolved from primarily cosmetic goals—smooth, healthy-looking skin—to more therapeutic and preventive goals—calming, repairing, strengthening, and defending stressed skin. The skin areas that require the most care and protection change during the course of a person's lifetime, despite the importance of skin care and protection. A person's skin changes in structure and function as they age, which increases their susceptibility to a number of clinically relevant skin conditions (such xerosis cutis). A unique approach to skin care is also required for conditions that affect the skin, such as bacterial or fungal infections, diabetes mellitus, renal insufficiency, or pharmacotherapies for cancer. ⁽⁴⁾

Ravindra G Gaikwad, Anilkumar J Shinde, Ashok A. Hajare (2022). This research paper consist of “Herbal treatment for management of Psoriasis: An Overview”. Psoriasis is an inflammatory skin condition that causes thick, red patches of skin that are coated in silvery scales along with inflammation (pain, edema, warmth, and redness). These lesions may itch or hurt. Psoriasis is now treated with systemic medicine, topical therapy, and phototherapy. These treatments come with a number of detrimental and possibly fatal adverse effects. Patients with psoriasis are more likely to acquire tumours, heart disease, Crohn's disease, arthritis with psoriasis, anxiousness, and stress. The fact that herbal medication is widely accessible, affordable, and efficient is why the majority of people utilise it. Numerous plants have positive traits, including notable successes when utilised to treat psoriasis. The goal of the current study is to give emphasis to these

crops, herbal remedies, and related therapies that may help create a more powerful, reliable, safe formulation to treat psoriasis and help new investigators who work in this field. ⁽⁵⁾

Abhinava Garg, Gautam Ghosh, Amit K. Goyal (August 2020). This research paper consists of “Recent advances in topical carriers of Anti-fungal agents”. Fungus-related skin infections are the most widespread problem related to skin health. Fungal infections are usually treated with regional or systemic antibiotics. Topical fungal medicines are frequently chosen due to their personalised therapy and limited side effects. Advanced topical carriers solve biopharmaceutical problems with conventional drug delivery vehicles, such as poor retention and low bioavailability, thanks to their unique structural and functional features. According to evidence in the literature, topical nanocarriers containing anti-fungal drugs have improved therapeutic response with fewer side effects. Nanocarriers such as Solid-Lipid nanoparticles, Microemulsions, Liposomes, Niosomes, Microsponge, Nanogel, Nanoemulsion, Micelles, etc. are widely used to distribute topical anti-fungal drugs. This article offers a summary of recent developments in innovative topical carriers that are used to increase the therapeutic efficacy of antifungal medicines. ⁽⁶⁾

ANATOMY OF SKIN

Key characteristics of the skin include:

- It is the largest organ of the body.
- It constitutes approximately 16% of the body weight.
- The surface area of the skin ranges from 1.5 to 2 square meters.
- In terms of thickness, it varies from 0.5 to 3 millimeters.

The skin is comprised of three layers:

1. Epidermis (50-100 micrometers thick)
2. Dermis (1-2 millimeters thick)
3. Hypodermis (1-2 millimeters thick)

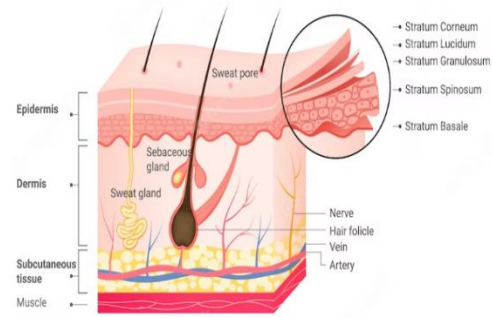


Figure 1. Structure of Skin

1. Epidermis:

The epidermis is the outermost layer of the skin, composed of stratified keratinized squamous epithelium. It is a thin, superficial portion of epithelial tissues.

Within the epidermis, there are four main types of cells:

- a. Keratinocytes: These cells produce strength and contribute to the formation of a protective barrier.
- b. Melanocytes: They are responsible for skin coloration.
- c. Langerhans cells: These cells are part of the immune system.
- d. Merkel cells: They detect light touch and pressure.

The epidermis is divided into five sublayers:

- i. Stratum Corneum: This is the outermost layer consisting of 25-30 layers of flattened keratinocytes. It provides protection to the underlying layers.
- ii. Stratum Lucidum: Found only in thick skin areas like fingertips, palms, and soles, this thin, transparent layer is a subdivision of the stratum corneum.
- iii. Stratum Granulosum: This middle and superficial layer of the non-keratinized portion of the epidermis contains spindle-shaped cells with granules rich in keratohyalin, cystine, and histamine proteins.
- iv. Stratum Spinosum: This layer is characterized by 8-10 layers of closely fitting, polygonal keratinocytes. The cells flatten, and their nuclei shrink, giving them a spiny appearance.
- v. Stratum Germinativum: It is the deepest layer of the epidermis and constantly proliferates to renew the skin. This layer contains melanocytes, which are responsible for producing and distributing melanin, giving color to the skin. The stratum germinativum

contributes to the thickness and overall health of the skin.

2. Dermis:

The dermis is the second layer of the skin, located deeper beneath the epidermis. It is composed of connective tissue that contains collagen and elastin fibers. Within the dermal tissue, you can find blood vessels, nerve endings, sweat glands, and hair follicles.

3. Hypodermis:

The hypodermis is a subcutaneous layer situated beneath the dermis. Although it is not technically part of the skin, it lies beneath it. This layer is primarily composed of adipose (fat) tissue and areolar tissue. It serves as a storage depot for fat and houses large blood vessels that supply the skin with nutrients.

Function of the Skin

1. The skin acts as a protective barrier, shielding the body from mechanical, thermal, and physical damage.
2. It helps in preventing the loss of moisture from the body.
3. The skin plays a role in reducing the harmful effects of UV radiation from the sun.
4. It is involved in the production of vitamin D when exposed to sunlight.
5. The skin secretes sweat and sebum, which contribute to keeping the skin soft and moisturized.
6. Additionally, the skin stores fat, water, chlorides, and sugar to varying extents.

Fungal Infection

An invasive fungus can result in a sickness that affects only the skin, spreads to the bones and organs, or affects the entire body.

A fungus-induced inflammatory disease, mycosis. The development and spread of an infectious disease is known as zymosis in medicine (especially one caused by a fungus) any of various skin or mucous membrane diseases brought on by the Blastomycosis.

Infections with fungi are widespread in the natural world. Fungal infections in humans happen when an invasive fungal growth overwhelms a body part's immune system and takes over. The soil, water, plants, and air are all habitats for fungi. Moreover, several fungi naturally inhabit the human body.

Type of fungal infection:

Superficial: Skin and mucous membranes. Examples of dermatophytes that damage the keratin layer of skin, hair, and nails include tinea versicolor. such as ring worm infestation and tinea pedis.

Ringworm: Ringworm is caused by a collection of fungus that feed on skin, hair, and nail cells.

Candidiasis: Nail infections, vulvo-vaginitis, oral thrush, and yeast-like symptoms.

Deep infections: Impact the heart, lungs, and brain and can cause pneumonia, endocarditis, and meningitis.

Subcutaneous: You could acquire a fungal infection beyond the skin's surface if fungus penetrates into a cut or wound, frequently via damage when interacting with plants.

Overview of Fungal Skin Infection

The majority of superficial and subcutaneous fungal infections are quickly and easily treatable.

Between the toes, in the vaginal region, and under the breasts are examples of wet body regions where skin surfaces converge and are frequent habitats for fungi. The main causes of ordinary fungal skin infections are yeasts (like Candidiasis or Malassezia furfur) or dermatophytes (for instance, as Epidermophyton, Microsporum, and Trichophyton). Several of these fungi are restricted to living in the stratum corneum, the epidermis' outermost layer. You are more susceptible to fungus infections if your defence mechanism fails to work effectively. Obese people are more liable to pick up these infections due to their expansive skinfolds, particularly when the skin inside the skinfold produces irritation and harm (intertrigo). Patients with diabetes tend to be more prone to fungal infections.

Strangely, fungal infections on one region of the body might result in rashes on unaffected parts of other parts of the body. For instance, an itchy, bumpy rash on the fingers could result from a fungal infection on the foot. Allergies to the fungus are the cause of these eruptions, often known as dermatophytids or identification or id reactions. Not touching the affected region does not cause them.



Figure 2. Fungal Infection

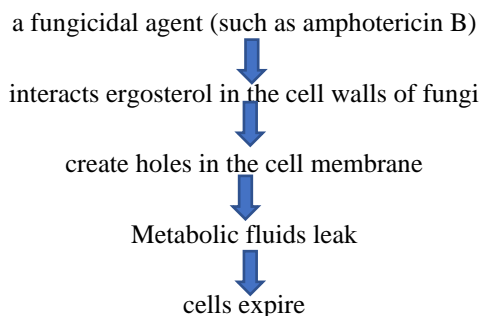
Symptoms

- Skin abnormalities comprise a deep red along with peeling or splitting skin.
- Itching
- Scaly skin
- Irritation and redness
- Swelling
- Blisters

Causes of fungal skin infection

- Imbalance of bacteria is due to following reasons:
- Due to use of antibiotics
- Hormone imbalance
- Poor eating habit

Pathophysiology



Diagnosis

Doctors can identify a fungal infection if they detect a red, itchy, or scaly rash in one of the often-affected parts. To confirm the diagnosis of a fungal skin infection, a tiny portion of skin can be scraped off and

analysed under a magnifying glass or placed in a culture medium where a particular fungus can develop and be diagnosed.

Treatment

Antifungal medications.

Preventative measures for moisture.

Antifungal drugs, often referred as topical remedies, are frequently employed to treat fungus infections by applying them directly to the affected area. Topical medications can come in the form of creams, gels, lotions, shampoos, and solutions, among others. Oral antifungal medications are additionally offered.

Users may also utilise methods like applying powder or donning open-toed shoes to keep the affected areas dry in along with medicine.

Doctors sometimes prescribe corticosteroids to treat certain infections with the goal to reduce swelling and irritation.

Psoriasis

Psoriasis is an inflammatory disease in which an overactive immune system produces an abnormally rapid increase in cell build up on the skin surface.

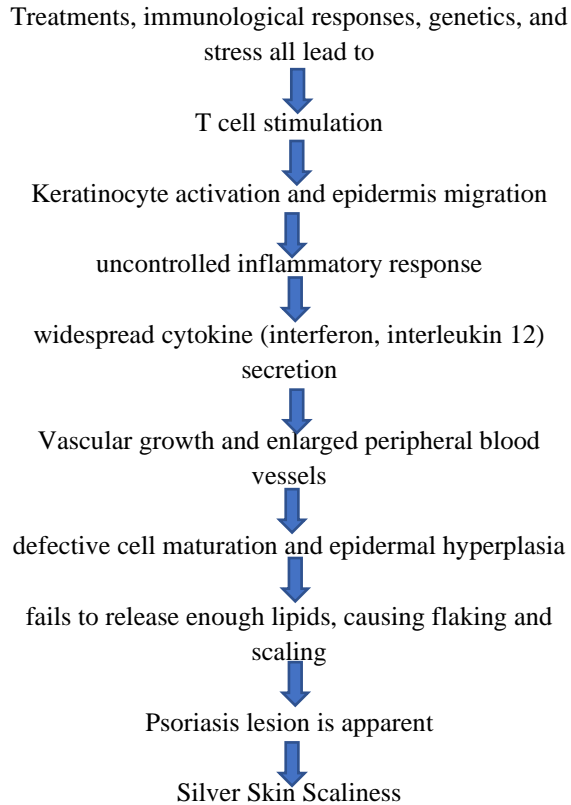


Figure 3. Psoriasis

Etiology

- Family History
- Smoking
- Alcohol
- Obesity
- Medication like Beta Blockers Lithium Chloroquine
- Infection: Post Streptococcal infection and HIV

Pathophysiology



Types of Psoriasis ⁽⁸⁾

1 Plaque Psoriasis

The most typical kind is this. This sort affects about eight out of ten people with psoriasis. It may be referred to by your doctor as "psoriasis vulgaris."

2 Guttate Psoriasis

This kind frequently begins in kids or young adults. It causes roughly 8% of instances of psoriasis. Even without treatment, this type of psoriasis may clear up in a few weeks. However, other conditions are more difficult to treat.

3 Inverse Psoriasis

This type is usually found in these locations:

- Armpits
- Groin
- Below the breasts
- Skin folds around the urinary tract and buttock

4 Pustular Psoriasis

This kind may appear on just one part of your body, like the hands or feet. Pustular psoriasis that

occasionally affects the majority of your body is known as "generalised" psoriasis. Get medical help right soon because this might be a very serious situation.

5 Erythrodermic Psoriasis

The least frequent but most serious form is this one. The majority of your body is affected and the skin becomes all over scorching and looks burned.

Treatment ⁽⁷⁾

The National Institute for Health and Care Excellence (NICE) in the UK has published recommendations explaining the various therapy options for treating psoriasis. These alternatives include systemic treatment, phototherapy, and topical therapy. The initial treatment strategy frequently entails applying topical drugs such corticosteroids or vitamin D analogues (calcipotriol) to the affected area. Techniques like occlusion or combination therapy, which combines betamethasone and calcipotriol, can increase the effectiveness of topical treatment.

Dithranol and tar preparations, previously extensively employed, are now less commonly utilized due to their tendency to induce allergic reactions and discoloration. When it comes to treating psoriasis in challenging areas such as the scalp, face, nails, sexual organs, palms, and toes, special care is necessary due to the significant negative effects on functionality and the generally unsatisfactory treatment response. It is important to note that the use of steroids on the face or genitalia should be temporary, as prolonged application may result in skin sagging and a condition known as steroid-induced.

Narrowband ultraviolet B radiation (NB-UVB) and psoralen with ultraviolet A radiation (PUVA) are examples of phototherapy, whereas methotrexate, ciclosporin, and acitretin are examples of conventional systemic medications employed as second-line therapy. Due of the increased risk of skin cancer from chronic PUVA dosages, NB-UVB has mainly replaced PUVA.

Every week, people usually consume oral methotrexate. Methotrexate inhibits lymphocytes by a number of procedures, including adenosine accumulation, dihydrofolate reductase inhibition, and aminoimidazole carboxamide ribotide transformylase (AICARTase) obstruction. The suppression of bone marrow is its most severe side effect. The calcineurin

inhibitor closporin acts rapidly, however it can also lead to hypertension and irreversible kidney failure. An oral retinoid called acitretin stimulates keratinocyte differentiation. Hair loss, hyperlipidemia, hepatotoxicity, and dry skin are a few of its potential side effects. Acitretin and methotrexate should not be used during pregnancy.

Material:

India is a developed nation where books with an appropriate quantity of information about natural resources are easily available. It indicates that the approximately 5,000-year-old Ayurvedic medical system is still in use nowadays. In addition, a variety of natural therapies are utilised to treat skin-related issues.

Sulphur



Figure 4. Sulphur

Sulphur is a non-metallic substance which belongs to the oxygen family. This is one of the elements that reacts the most. Pure sulphur is a tasteless, odourless, crumbly solid that is pale yellow in colour, insoluble in water, and exhibits a low electrical conductivity. Each year, thousands of pounds of sulphur are created.

Use

Sulphur is used to treat itchy skin rashes, particularly those that are aggravated by heat, water, or contact with specific textiles like wool. Scabies and seborrheic dermatitis are both treated with it. Additionally, it is utilised to promote the synthesis of N-acetylcysteine, glutathione, and S-adenosylmethionine.

Salicylic Acid



Figure 5. Salicylic Acid

The EPA has categorised the organic chemical salicylic acid, a plant hormone, as a hazardous toxin. Salicylic acid made in a lab is odourless and colourless. The acid tastes rather pleasant at first, then bitter. They should not be utilised once their shelf life, which is typically one year, has passed. It is regarded as one of the top remedies for acne scars and blemishes.

Use

It slows down and stops the growth of infections by stopping the fungus' metabolism. It treats infections caused by tinea pedis. Scale, induration, irritation, and erythema are lessened because to the anti-inflammatory and exfoliating properties that work together. By lowering swelling and redness, it cures acne.

Neem



Figure 6. Neem

Biological Name: Azadirachta Indica

Neem is most likely indigenous to South Asia's drier regions, including the Indian subcontinent. Neem trees have appealing rounded crowns, thick furrowed bark, and a height range of 15 to 30 metres (49 to 98 ft).

Use

The antibacterial and antifungal characteristics of the neem tree are the basis for many of the tree's medical and aesthetic uses, which extend to nearly all of its components. Neem is frequently included in soaps or creams for skin disorders like acne, psoriasis, and athlete's foot in addition to shampoos for treating dandruff.

METHODOLOGY

Preparation of simple cream base

Clean all the glassware and dry them properly as per SOP.

Formulation Table:

Table 1 Role and Quantity of Ingredients

Sr No.	Ingredients	Quantity	Use
1.	Borax	1.6 gm	Emulsifier and Preservative
2.	Bees wax	7.30 gm	Antibacterial and Stiffener
3.	Paraffin liquid	20 ml	Hydrating and Cleansing agent
4.	Water	10 ml	Vehicle
5.	Sulphur	5.15 gm	Anti- Bacterial agent
6.	Salicylic acid	3.7 gm	Anti- Acne agent
7.	Neem	3 gm	Anti- Fungal agent
8.	Methyl Paraben	2.11 gm	Preservative
9.	Anise Oil	2 to 3 drop	Flavouring agent

Evaluation Parameter:

Table 2 Evaluation Parameters of skin cream

Test	Observation
Physical appearance	Semi-solid
Texture	Smooth and Creamy
Color	Greenish
Odor	Characteristic
PH value	6.1
Stability Test	Stable
Degradation of product	No
Irritancy	No

Physical Evaluation:

Physical examination was used to evaluate the density, strength, pH, colour, texture, and aroma.

Color:

The color was inspected visually greenish in colour.

Odor:

The odor was perceived by sensing the formulations.

PH:

Due to any number of consumption as well as before each and every pH measurement, the pH scale should

Weight or all ingredients properly.

Bees wax and paraffin liquid were dissolve in the oil phase and heated up to 80c.

Borax and water were dissolve in water phase and heated up to 80c.

During heating, the aqueous phase was gradually added to the oil phase while constantly stirring it. Add sulphur, salicylic acid and neem in above solutions until cream was formed.

At the end, add little quantity of perfuming agent for fragrance.

be calibrated. The electrode ought to be cleansed after calibration before being immersed in the test liquid.

Texture:

It is applied on hand and then its texture is checked according to its foam and smoothness.

Stability:

The prepared ointment was subjected to stability studies by keeping it at various temperatures such as 40°C, 25°C and 37°C for 1 week. During this time, it showed no phase separation or change in colour.

Irritancy:

It was laid on the layer of skin and allow to absorb. An hour was used for examining the skin for any symptoms of inflammation, redness, itching, or discomfort. For the marketed formulation, the identical method was done.

CONCLUSION

We formulate skin cream for psoriasis and fungal infection and it showed effect on both. Salicylic acid

in this formulation was very useful as anti-acne activity. Neem gave special effect as antiseptic as well as antifungal. Sulphur helped to reduce itching as well as lesions during psoriasis. The solution was steady at ambient temperature and can be securely administered on the skin based on evaluation standards and outcomes.

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