International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 11 | Nov - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Review on Advances in Herbal-Based Burn Cream Formulations

Rupesh Pal[1], Priyanshu Dewangan[1], Gautam Kumar Yadav[2], Harish Sharma[3], Gyanesh Kumar Sahu[1*]

[1]Rungta Institute of Pharmaceutical Sciences & Research, Kohka, Kurud, Bhilai

[2]Rungta Institute of Pharmaceutical Sciences, Kohka, Kurud, Bhilai

[3]School of Pharmacy, Anjaneya University, Raipur

Corresponding Author:
Dr Gyanesh Kumar Sahu
Professor & Dean
Rungta Institute of Pharmaceutical Sciences & Research, Bhilai
Email- drgyaneshkumarsahu@gmail.com

Abstract –

Burn injuries are a common and severe form of trauma that significantly impact health, requiring effective wound care to prevent infection, reduce scarring, and promote healing. The development of herbal burn creams has gained interest due to their natural bioactive compounds with antimicrobial, anti-inflammatory, and wound-healing properties. This study focuses on formulating a novel herbal burn cream containing Aloe vera, Turmeric (Curcuma longa), and Calendula officinalis extracts, which are well-documented for their therapeutic effects.

Keywords – Burn, Aloe vera, Calendula officinalis

Introduction

An injury to the skin or other organic tissue that is predominantly brought on by heat, radiation, electricity, radioactivity, friction, or contact is called a burn with substance It is a common and troublesome critical care issue. Prolonged exposure to high temperatures during burn trauma causes tissue damage through the thermal denaturation of proteins and the breakdown of the integrity of the plasma membrane. These lesions result in the release of toxic metabolites, antigens, and immunomodulatory substances in addition to cell death and other molecular structural changes An inflammatory response occurs after the initial tissue damage, involving a large local influx of inflammatory cells that release a variety of chemicals that coordinate the activity of immunocompetent cells. Localized oedema is a reflection of these calls' action [1].

Based on their depth, burn wounds are divided into three groupings. degree (superficial), half thickness (second degree), and full thickness (third degree). as well as antiseptic properties. The optimum action for treating burn wounds was demonstrated by aloe vera, zingier officinal. Various herbs had active ingredients called flavonoids,

alkaloids, saponins, and phenolic compounds that promoted wound closure. Proteolytic enzymes and glycosides, such as madecassoside and asiaticoside, were the primary active ingredients. Through a variety of mechanisms, including as antibacterial, anti-inflammatory, antioxidant, collagen synthesis stimulation, cell proliferative, and antigenic effects, phytochemicals demonstrated beneficial activity at various stages of the burn wound healing process. In general, a number of herbal medications have demonstrated notable efficacy in the treatment of wounds, particularly burn injuries, and as such, may be regarded as an alternate therapeutic option. [2]

History

Human evolution has been significantly impacted by the discovery and management of fire since it provides light and heat, but its introduction also normalized the danger of thermal harm and the ensuing requirement for burn wound care. Burn with a large portion of medical teaching based on presumptions about supernatural powers and their function in wound healing, care was scarce in the ancient world. Around 1500 BCE, the earliest Egyptian scrolls include descriptions of burn dressings made with milk from moths and rituals invoked by the goddess of magic and life, Isis. The pathophysiology of burns was not well understood at the time, therefore healers turned to well-known products. For pain relief, the ancient Egyptians turned to belladonna, opium, and thyme. According to ancient Greek and Roman records, pig fat was used, bitumen and resin to cure burns. Honey was frequently used in burn dressings and healing ointments according to Ayurveda (old Indian) medicinal books. Similarly, traditional Chinese medicine used a combination of knowledge, philosophy, and herbal remedies to treat burns. Those with more severe burns did not benefit much from these treatments, even though many of them offered a slight temporary reduction in discomfort. In fact, individuals suffering from serious burns could only wait in hospitals for their infected skin to peel off. Allowing open wounds to develop into contractures, permanent impairments, or even worse, sepsis and deal Given these dismal results, doctors at the time were not very concerned with their patients' psychological well-being or quality of life. The act of survival was a great success.There was no recognized link between burns and psychological conditions like depression because of the high death rate from burn injuries and the dearth of scientific evidence supporting this claim. Although there was little basic knowledge of psychology in antiquity, initial theories on the existence of [3]. Another phrase that might have been used to avoid confusion with litharge (derived from the Greek) is "infernal stone." For millennia, the name "silver stone" has been used to refer to a substance that is as hard as stone and has a silvery colour; its chemical composition is really lead oxide Lithos means stone and argyrols means silver. Given that silver was connected to the moon during the Middle Ages, it would appear that the origin of the term "lunar caustic" would be simpler to explain. Dorland's Illustrated Medical Dictionary defines this substance as follows: Silver nitrate toughened [USP] is a substance that is created by combining silver nitrate with potassium nitrate, sodium chloride, or hydrochloric acid. It manifests as white crystalline masses that are shaped into pencils. [4]

Disease

Sepsis - Patients experience persistent tachycardia, tachypnea, and an increase in baseline core temperature as a result of physiological and metabolic reactions following severe thermal injury. Thus, almost all patients fulfil the criteria for the burn patient's systemic inflammatory response syndrome, which has minimal discriminative significance. Consensus recommendations that propose modified definitions for applying the systemic inflammatory response syndrome criteria to burn patients have been produced by the American Burn Association. Additional trustworthy indicators of sepsis diagnosis are needed. The three most often utilized indicators are erythrocyte sedimentation rate, C-reactive protein, and white cell count. Preventing sepsis is essential while caring for a patient who has suffered serious burns. Along with routine infection control procedures, skin grafts and early excision are now
standard procedure. Six studies that satisfied their inclusion criteria were found in a meta-analysis comparing conservative management and early excision with late grafting.

Although sepsis was employed as an outcome measure in two of these trials, the definitions utilized made comparisons challenging. According to one study, the early excision group had fewer positive wound cultures and needed antibiotic medication for a shorter period of time. [5]

Burn shock syndrome - Cardiogenic, hypovolemic, and distributive shock are the outcomes of burn injury. Increased capillary permeability and fluid changes are the main causes of the intravascular volume being reduced. greater than 30% of the body's total surface area (TBSA), a widespread decrease in sodium ATPase activity and a disruption of the cellular transmembrane ionic gradient that lasts for several days mean that fluid resuscitation can only partially compensate. Protein loss occurs as a result of microvascular damage brought on by inflammatory mediators like histamine, bradykinin, prostaglandins, leukotrienes, vasoactive amines, platelet activation products, and complement. Interstitial fluid. Fluid leaves the circulatory system as the intravascular colloid osmotic pressure drops. Rapid equilibration with the interstitial compartments causes a loss of intravascular fluid, electrolytes, and proteins. [5]

Marjolin's ulcer - A Marjolin's ulcer is an uncommon and severe form of cancer that develops in burn scars, chronic wounds, or regions of persistent inflammation. Squamous cell carcinoma is the most common type, but melanoma or basal cell carcinoma are also possible. The latent phase of Marjolin's ulcer, which can last for years or even decades following the original lesion, is when the area develops malignant change. Marjolin's ulcer is characterized by its propensity to spread if left untreated, its high potential for local invasion, and its correlation with chronic wounds. The underlying mechanisms, which may encourage carcinogenesis, include recurrent trauma, chronic inflammation, and altered immune responses in the affected area. [6]

Toxic Epidermal Necrolysis- severe hypersensitive reaction that affects over 30% of the body's surface and is marked by extensive epidermal necrosis and separation. Antibiotics, anticonvulsants, and non-steroidal anti-inflammatory drugs are among the major medications that cause it. [7] TEN, which is driven by immunological responses such as cytotoxic T-cell activity and extensive keratinocyte death, is frequently referred to as the severe end of the range of Stevens-Johnson Syndrome (SJS)/TEN overlap diseases. Clinically, it begins with flu-like symptoms and quickly develops into painful, erythematous macules that eventually cause mucosal involvement and widespread skin detachment.[8] Review literature highlights TEN as a medical emergency with high mortality rates, often exceeding 30%, and underscores the importance of identifying risk factors, such as genetic predisposition (e.g., HLA alleles), and implementing prompt interventions, including systemic therapies like IV immunoglobulin or cyclosporine, alongside meticulous supportive care.[9]

Thermal Burns- Thermal burns are wounds that result in varied degrees of tissue damage and are brought on by exposure to external heat sources like fires, scalding liquids, hot surfaces, or steam. Based on the extent of damage, these burns are divided into three categories: first-degree (epidermal), second-degree (partial-thickness), and third-degree (full-thickness). The total body surface area (TBSA) impacted and the degree of skin and tissue involvement determine the severity. Thermal burns need to be treated quickly and thoroughly because they can cause systemic problems like fluid loss, infection, and metabolic disruptions in addition to local inflammatory reactions. [10]

Types of Burns - The pathophysiology, depth of injury, and origin of burn injuries are used to classify them. Types that are widely acknowledged include: [11]

Chemical Burns: occur as a result of coming into touch with corrosive materials, such as industrial chemicals, acids, or alkalis, which cause chemical reactions that destroy tissue. [11]

Electrical Burns: These burns, which are brought on by electrical currents flowing through the body, frequently cause deep tissue damage that may not be immediately noticeable, affecting muscles, nerves, and even bones. [12]

Radiation Burns: arise from extended exposure to radiation sources, such as ionizing radiation from medical procedures or ultraviolet (UV) radiation from the sun. [12]

Friction Burns: Combine friction-generated heat and mechanical abrasion, which is frequently observed in trauma or accidents. [13]
Cold Burns (Frostbite): Extreme cold, albeit less frequently mentioned, can harm tissues similarly to thermal burns. [13]

Classification in figure

According to the depth of the burn- [14]

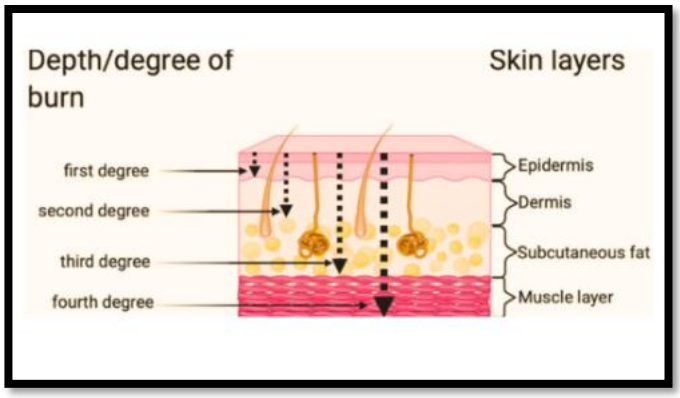

Fig 1 Skin layer [14]

First degree burn-

Fig 2 First degree burn [15]

Second degree burn-

Fig 3 Second degree burn [16]

Third degree burn-

Fig 4 Third degree burn [17]

Herbal Burn Cream Dosage Forms

Herbal burn creams are made with substances derived from plants that are known to have antibacterial, anti-inflammatory, and wound-healing qualities. Different dose forms for these formulations are available, depending on the kind and extent of burns. The frequently used dose forms are shown below.[18]

Creams: Herbal extract-based semi-solid emulsions for improved skin absorption and ease of application.[18]

Gels: Transparent, water-based formulations that are appropriate for first-degree and partial-thickness burns, offering a cooling effect and rapid drying.[19]

Ointments: Preparations based on oil provide extended skin contact, forming a barrier of protection for more severe burns.[19]

Sprays: When direct touch is difficult, liquid formulations in aerosol or pump systems are perfect for big or painful burn regions.[20]

Patches: Localized healing is promoted by adhesive herbal patches that provide active substances to the wound site over an extended period of time.[20]

New drug

Silver Sulfadiazine (Silvadene) – Often used in hospitals for second- and third-degree burns due to its broad-spectrum antibacterial properties.[21]

Neosporin Burn Relief – Contains pain-relieving ingredients along with antibiotics to prevent infection in minor burns.[21]

Polysporin – An antibiotic ointment that helps prevent infections in minor burns and cuts.[22]

Hydrocortisone Cream – Useful for reducing inflammation and itching in minor burns, though it is not antibacterial.[22]

Patent

Table-1 Patent Details

S. No	Authors	Title	Patent Number	Submission Date	Publication Date	Reference
1	Zhang, et al.	Herbal Composition for Skin Burn Treatment	US9345561B2	2015-05-13	2016-05-24	23
2	Gupta, R., et al.	Aloe-Based Burn Healing Formulation	US20170233211A1	2017-02-16	2017-08-17	24
3	Lee, J., et al.	Method for Extracting Calendula for Burns	US8110513B2	2010-08-12	2012-02-07	25
4	Chen, M., et al.	Turmeric-Infused Burn Treatment Gel	EP2975544A1	2014-07-25	2016-01-20	26
5	Nakamura, T., et al.	Herbal Cream for Burns Containing Neem Oil	JP2016505943A	2015-08-14	2016-02-18	27
6	Patel, A., et al.	Antibacterial Burn Cream	US10772932B2	2019-03-22	2020-09-15	28

		with Natural Oils				
7	Kumar, S., et al.	Multipurpose Herbal Gel for Skin Burns	WO2017175432A1	2017-08-18	2018-02-22	29
8	Ramesh, K., et al.	Honey-Based Burn Cream with Antibacterial Herbs	US20170276035A1	2016-04-06	2017-10-12	30
9	Singh, N., et al.	Herbal Burn Ointment with Anti-inflammatory Agents	US20170276035A1	2016-12-29	2017-09-28	31
10	Chen, L., et al.	Burn Healing Cream Using Traditional Herbs	CN104065326B	2013-12-06	2016-03-09	32

Future prospects-

The growing popularity of natural and plant-based treatments bodes well for the future of herbal burn creams. Research indicates that these compositions' antibacterial, anti-inflammatory, and skin-soothing qualities may aid in the healing of burn wounds. Aloe vera, turmeric, and neem oil, for instance, have shown promise in encouraging skin renewal while reducing the negative side effects of commercial products.[2]

Another thorough explanation of the potential of herbal burn creams for the future emphasizes how their eco-friendly and biocompatible formulas might improve wound care. The possibility of incorporating herbal extracts such as Centella asiatica, Aloe vera, and curcumin into sophisticated drug delivery systems including hydrogels, nanogels, and biofilms is highlighted by recent study. The goal of this integration is to improve the active chemicals' stability, absorption, and prolonged release.[33]

Conclusion –

This review paper talks about how burn treatments have changed over time, focusing on herbal antiseptic burn creams. It explains that people used natural remedies like honey and plant-based ingredients in ancient times. Today, more advanced antiseptic treatments, such as silver sulfadiazine, are used to prevent infections and help burns heal. Herbal burn creams, made from natural ingredients like Aloe Vera, Neem, and Turmeric, are highlighted as safe and effective options. These creams help reduce pain, prevent infection, and support the skin's healing process.

The paper also discusses different types of burns—first-degree, second-degree, and third-degree—helping us understand how severe each type can be. It emphasizes that herbal burn creams are becoming more popular because people want natural and eco-friendly products. With ongoing research and new product developments like ointments, gels, and sprays, herbal burn creams are expected to become even more common in the future, offering a natural alternative for treating burns safely at home.

References –

1. Anusha, P., & Krishna, J. G. (2021). Ayurvedic herbal medicines on burn wound: A review. International Journal of Ayurveda and Pharma Research, 35-40.
2. Limbraj, M. S., Saher, Q. R., Amol, J., & Prakash, P. M. (2020). FORMULATION AND EVALUATION OF HERBAL ANTISEPTIC BURN CREAM. IJRAR-International Journal of Research and Analytical Reviews (IJRAR), 7(2), 195-202.

3. Chokshi, S. N., Powell, C. M., Gavrilova, Y., Wolf, S. E., & Ozhathil, D. K. (2022). A narrative review of the history of burn-related depression and stress reactions. Medicina, 58(10), 1395.

4. Klasen, H. J. (2000). A historical review of the use of silver in the treatment of burns. II. Renewed interest for silver. Burns, 26(2), 131-138.

5. Snell, J. A., Loh, N. H. W., Mahambrey, T., & Shokrollahi, K. (2013). Clinical review: the critical care management of the burn patient. Critical Care, 17, 1-10.

6. Copcu, E. (2009). Marjolin's ulcer: a preventable complication of burns?. Plastic and reconstructive surgery, 124(1), 156e-164e.

7. Nizamoglu, M., Ward, J. A., Frew, Q., Gerrish, H., Martin, N., Shaw, A., ... & Dziewulski, P. (2018). Improving mortality outcomes of Stevens Johnson syndrome/toxic epidermal necrolysis: A regional burns centre experience. Burns, 44(3), 603-611.

8. De Bustros, P., Baldea, A., Sanford, A., Joyce, C., Adams, W., & Bouchard, C. (2022). Review of culprit drugs associated with patients admitted to the burn unit with the diagnosis of Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis Syndrome. Burns, 48(7), 1561-1573.

9. Coias, J. L., Abbas, L. F., & Cardones, A. R. (2019). Management of Stevens-Johnson syndrome/toxic epidermal necrolysis: a review and update. Current Dermatology Reports, 8, 219-233.

10. Gueugniaud, P. Y., Carsin, H., Bertin-Maghit, M., & Petit, P. (2000). Current advances in the initial management of major thermal burns. Intensive care medicine, 26(7), 848.

11. Żwierełło, W., Piorun, K., Skórka-Majewicz, M., Maruszewska, A., Antoniewski, J., & Gutowska, I. (2023). Burns: Classification, pathophysiology, and treatment: A review. International journal of molecular sciences, 24(4), 3749.

12. Dobson, G. P., Morris, J. L., & Letson, H. L. (2024). Pathophysiology of severe burn injuries: new therapeutic opportunities from a systems perspective. Journal of Burn Care & Research, irae049.

13. Singh, Vijay, Lara Devgan, Satyanarayan Bhat, and Stephen M. Milner. "The pathogenesis of burn wound conversion." Annals of plastic surgery 59, no. 1 (2007): 109-115.

14. Żwierełło, W., Piorun, K., Skórka-Majewicz, M., Maruszewska, A., Antoniewski, J., & Gutowska, I. (2023). Burns: Classification, pathophysiology, and treatment: A review. International journal of molecular sciences, 24(4), 3749.

15. Dobson, G. P., Morris, J. L., & Letson, H. L. (2024). Pathophysiology of severe burn injuries: new therapeutic opportunities from a systems perspective. Journal of Burn Care & Research, irae049.

16. Kumar, R., Keshamma, E., Kumari, B., Kumar, A., Kumar, V., Janjua, D., & Billah, A. M. (2022). Burn injury management, pathophysiology and its future prospectives. Journal for Research in Applied Sciences and Biotechnology, 1(4), 78-89.

17. Baimuratova, M., & Abashidze, I. (2023). Burn Injuries: Epidemiology, Diagnosis and Treatment. Medicine, Science and Education, (2), 33-50.

18. Kumar, M., Mahmood, S., & Mandal, U. K. (2022). An updated account on formulations and strategies for the treatment of burn infection-a review. Current Pharmaceutical Design, 28(18), 1480-1492.

19. Gwarzo, I. D., Mohd Bohari, S. P., Abdul Wahab, R., & Zia, A. (2022). Recent advances and future prospects in topical creams from medicinal plants to expedite wound healing: a review. Biotechnology & Biotechnological Equipment, 36(1), 82-94.

20. Ryall, C., Duarah, S., Chen, S., Yu, H., & Wen, J. (2022). Advancements in skin delivery of natural bioactive products for wound management: a brief review of two decades. Pharmaceutics, 14(5), 1072.

21. Hussain, Z., Thu, H. E., Rawas-Qalaji, M., Naseem, M., Khan, S., & Sohail, M. (2022). Recent developments and advanced strategies for promoting burn wound healing. Journal of Drug Delivery Science and Technology, 68, 103092.

22. Rosenberg, L., Krieger, Y., Bogdanov-Berezovski, A., Silberstein, E., Shoham, Y., & Singer, A. J. (2014). A novel rapid and selective enzymatic debridement agent for burn wound management: a multi-center RCT. Burns, 40(3), 466-474.

23. Zhang, et al. (2016). Herbal Composition for Skin Burn Treatment. Patent No. US9345561B2.

24. Gupta, R., et al. (2017). Aloe-Based Burn Healing Formulation. Patent No. US20170233211A1.

25. Lee, J., et al. (2012). Method for Extracting Calendula for Burns. Patent No. US8110513B2.

26. Chen, M., et al. (2016). Turmeric-Infused Burn Treatment Gel. Patent No. EP2975544A1.

27. Nakamura, T., et al. (2016). Herbal Cream for Burns Containing Neem Oil. Patent No. JP2016505943A.

28. Patel, A., et al. (2020). Antibacterial Burn Cream with Natural Oils. Patent No. US10772932B2.

29. Kumar, S., et al. (2018). Multipurpose Herbal Gel for Skin Burns. Patent No. WO2017175432A1.

30. Ramesh, K., et al. (2017). Honey-Based Burn Cream with Antibacterial Herbs. Patent No. US20170276035A1

31. Singh, N., et al. (2017). Herbal Burn Ointment with Anti-inflammatory Agents. Patent No. US20170276035A1.

32. Chen, L., et al. (2016). Burn Healing Cream Using Traditional Herbs. Patent No. CN104065326B.

33. Fahimi, S., Abdollahi, M., Mortazavi, S. A., Hajimehdipoor, H., Abdolghaffari, A. H., & Rezvanfar, M. A. (2015). Wound healing activity of a traditionally used poly herbal product in a burn wound model in rats. Iranian Red Crescent Medical Journal, 17(9).