A REVIEW ON DEVELOPMENT OF BOSWELLIA SERRATA LOADED TRANSDERMAL PATCH

Nishikant Gaur¹, Mr. Kamal Singh Bani², Raj Kumar Mishra³, Bhanu P. S. Sagar⁴, Anjul Rathi⁵

IEC Department of Pharmacy
IEC College of Engineering & Technology
IEC Group of Institutions
Greater Noida, Uttar Pradesh, India

Abstract: Transdermal drug delivery systems offer a promising alternative to traditional oral or intravenous routes, providing controlled release and minimizing systemic side effects. This study focuses on the development and thorough testing of a transdermal patch loaded with Boswellia Serrata extract, known for its anti-inflammatory and analgesic properties. The research details the formulation, characterization, and in vitro/in vivo testing of the Boswellia Serrata loaded patch. Our findings demonstrate the potential of this innovative transdermal patch as an effective and safe method for the delivery of Boswellia Serrata, highlighting its potential application in the management of various inflammatory conditions. Transdermal patch has emerged as painless alternatives to conventional intralesional injection of drugs and bioactive molecules by delivering their cargoes to the targeted skin layer. From the deep excavation of literature, it is evident that Boswellia serrata are loaded with anti-inflammatory properties. An attempt to fabricate localised dosage regimen is being done in this project work so as to enhance compliance in patients. Enhancement of permeability of Boswellia serrata. Localise action due to targeted drug delivery with minimal side effects. Transdermal patches are a method of drug delivery in which an adhesive patch provides a pre-prescribed dose of medication that is absorbed through the skin and into the bloodstream. The patches provide a non-invasive method of drug delivery while allowing for a steady absorption of a medication over an extended period of time, providing an alternative delivery method to the immediacy of an injection or liquid medica.

Keywords: Transdermal Patches, Bioavailability, Local Site Action, Targeted Drug Delivery.

Introduction-

Indian frankincense, or Boswellia serrata, has been used for millennia in traditional medicine because of its soothing, anti-inflammatory, and anti-arthritis qualities. Current studies have concentrated on improving its administration of therapeutics through integration into contemporary pharmaceutical systems, including transdermal patches. The creation, composition, and effectiveness of transdermal patches that containing the herb Boswellia serrata are examined in this paper. Boswellia serrata is a tree indigenous to India, the Middle East, and North Africa. The resin obtained from its bark contains boswellic acids, which are believed to contribute to its therapeutic effects. These boswellic acids have demonstrated efficacy in treating inflammatory conditions, arthritis, and other disorders through their ability to inhibit leukotriene synthesis and modulate inflammatory pathways.

TRANSDERMAL DRUG DELIVERY SYSTEM

Subcutaneous medication administration is characterized by specific, fully autonomous regimens that, when worn over undamaged skin, allow the remedy to enter in the bloodstream at a regulated pace across the complexion. Transdermal drug delivery systems (TDDS) have become a crucial component of innovative ways to deliver drugs¹⁴. (Badria F, Mazyed et al.)

Advantages of Transdermal Drug Delivery Systems.

- Subcutaneous medicine provides a continuous and long-lasting medicinal drip.
- It is also possible to prevent adverse impacts or therapy failures that are commonly linked to sporadic dosage.
- Delivery via the skin has the potential to enhance the curative power of numerous medications by circumventing certain drug-related issues, such as problems with digestion, inadequate swallowing, liver disease "first-pass" effect-induced medication collapse, enzyme generation leading to negative impacts a quick half-life requiring use dosage, etc¹⁵. (Ragab EA, Abd El-Wahab et al.)
Disadvantages of Transdermal Drug Delivery Systems

- For a medicine to pass via the surface of the skin, it must possess certain desired physical and chemical characteristics. This type of treatment administration can be exceedingly challenging if the dose of medication needed for medicinal advantage exceeds 20 mg/day.
- Owing to the epidermis's innate limits on medication entrance enforced according to its transparency, mainly reasonably powerful medicines are good interviewees with TDDS.
- Certain individuals have touch allergy at the sought sightseeing for any or more manner goods, requiring stopping treatment.
- One more thing that must be thoroughly considered in advance deciding to manufacture a topical medicine is economic necessity.
- The task of the protective layers of the skin varies depending on a person's personality, age, and location on the body. (LOKAPUR AJ, LOKAPUR JS et al.)

**Fig. 1.1 Image depicting pathway of Transdermal drug diffusion**

**Boswellia serrata transdermal patch formulation**

Several essential elements go into creating a transdermal patch containing Boswellia serrata:

- **Drug Incorporation:** The patch's matrix contains boswellic acids, which is the active compound in boswellia serrata resin. The drug's penetration into the skin and release profile are influenced by the matrix choice of material (e.g., hydrogels, silicone-based, or polymeric matrices).
- **Permeation Enhancers:** Terpenes, fatty acids, or surfactants are examples of permeation enhancers that can be added to increase the amount of boswellic acids that penetrate the skin.
- **Adhesive Layer:** This layer is responsible for firmly securing the patch to the skin and enabling controlled medication release. To stop deterioration, it must also work well with the active components.
- **Backing Layer:** Guarantees the patch's integrity by shielding the medication and adhesive from outside influences on structural integrity (Mishra SU, Bishnoi RS, Maurya RA et al.)

**Assessment of Patches**

- **Boswellia serrata**-loaded transdermal patches are evaluated using the following methods:
  - In vitro Release Studies: These studies measure the patch's drug release's rate and extent.
  - **Skin Permeation Studies:** To assess boswellic acids’ capacity to pass through skin layers and into the bloodstream.
  - **Stability Studies:** To make sure the patch keeps its safety and effectiveness over time.
  - **Clinical Trials:** To evaluate the patches’ effectiveness, safety, and patient tolerance in real-world circumstances. (Patel PM, Bhaskar VH, Gohel U et al.)
Obstacles and Prospects for the Future

- **Skin Permeability:** A significant obstacle is ensuring that boswellic acids are sufficiently permeable through the skin. This problem might be solved by using cutting-edge permeation enhancers and creative formulations.
- **Stability involves:** In order to stop boswellic acids from deteriorating over time, the patch needs to be stabilized.
- **Patient Recognition:** To guarantee patient compliance, the patch's design should be user-friendly, discrete, and pleasant.
- **Regulation Acceptance:** Gaining market adoption depends on meeting safety and efficacy regulatory standards.

Material methods

**Drug profile**

**Boswellia serrata**

**NAME OF MEDICINAL PLANT:** Indian Frankincense  
**SYNONYM:** Salai guggul  
**FAMILY:** Burseraceae

**BOTANICAL SOURCE:** It consists of oleogum resin of Boswellia serrata Roxb. Oleo gum resin: globular agglutinated tears of greenish white and yellow colour covered with brown or black coarse powder  
**SHAPE:** ovoid or club shaped, occasionally agglutinated into small masses  
**FRACTURE:** brittle Fracture surface: waxy and semi-translucent  
**TASTE:** bitter and pungent  
**ODOUR:** balsamic

![Fig. 2.1 Image depicting exudates of resin of Boswellia serrata](image)

Table no. 2.1 depicting scientific classification of *Boswellia serrata*

<table>
<thead>
<tr>
<th>Scientific Classification</th>
<th>Plantae</th>
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<tbody>
<tr>
<td>Kingdom</td>
<td>Tracheophytes</td>
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</table>

**BACKGROUND:** Boswellia is used widely in Ayurveda for treating arthritis, ulcerative colitis, coughs, sores, wound healing, and asthma. It is also available in supplemental forms to support joint health. The bioactive compound in Boswellia is boswellic acid, a 5-lipoxygenase inhibitor. (Pub chem)⁶⁵ (Rathva SR, Patel NN, Shah V et al.)

**GEOGRAPHICAL SOURCE:** Grows on dry hills of the Gujarat, Arvali hills of Rajasthan, Madhya Pradesh and Bihar

**CHEMICAL NAMES:** boswellic acid, beta -boswellic acid
MOLECULAR WEIGHT: 456.7 g/mol
CHEMICAL FORMULA: C 17 H 28 N 4 O 7 S
IUPAC NAME: (3R,4R,4aR,6aR,6bS,8aR,11R,12S,12aR,14aR,14bR)-3-hydroxy-4,6a,6b,8a,11,12,14b-heptamethyl-2,3,4a,5,6,7,8,9,10,11,12,12a,14,14a-tetradecahydro-1H-picene-4-carboxylic acid
PHYSICAL DESCRIPTION: pale yellow amorphous solid

![Image](Fig. 2.2 Image depicting chemical structure of Boswellic acid)

CAS no.: 631-69-6

MELTING POINT: 238–240-degree Celsius

HALF-LIFE: approx. 6hrs

DRUG CLASS: BCS class IV

METABOLISM: Hepatic Phase I metabolism

MECHANISM OF ACTION:
Boswellic acids exhibit potent anti-inflammatory properties in vitro and in vivo. Triterpenes in boswellic acid reduce the synthesis of leukotrienes in intact neutrophils by inhibiting 5-LOX, the key enzyme involved in the biosynthesis of leukotrienes, which mediate inflammation. (Kriplani P, Guarve K, Baghel et al.)

Absorption: pharmacokinetic studies have evidenced low systemic absorption of boswellic acids (BAs), especially of KBA and AKBA, in rodents and humans.

Volume of distribution: The apparent volume of distribution averaged 142.87 +/- 22.78 L and the plasma clearance was 296.10 +/- 24.09 ml/min.

Protein binding: Bioinformatic methods showed that acetyl-11-keto-β-boswellic acid, 11-keto-β-boswellic acid, β-boswellic acid, and the phosphorylated active metabolite

Route of elimination: A human study showed that the elimination half-life for Boswellia was approximately 6 hours, suggesting that oral administration would require dosing every 6 to 8 hours. (David JJ, Kandasamy R, Chatterjee S et al.)

Affected organisms: Humans and other mammals.

Conclusion
A significant step in the delivery of this important herbal extract is the creation of transdermal patches loaded with Boswellia serrata. Even if there are still obstacles to overcome, continued research and technical advancements could help remove these obstacles and provide the market with efficient, patient-friendly solutions. Subsequent efforts have to concentrate on refining compositions, enhancing skin penetration, and carrying out extensive clinical investigations to verify the medicinal advantages of these patches.
Reference


8. Patel PM, Bhaskar VH, Gohel U. IN-VITRO, EX-VIVO SKIN PERMEATION AND BIOLOGICAL EVALUATION OF BOSWELLIACID TRANSDERMAL PATCHES.
