



## FORMULATION AND EVALUATION OF HYDROGEL TRANSDERMAL PATCH FOR THE TREATMENT OF ACNE

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### ABSTRACT:

The purpose of this article review was to study hydrogel acne patch formulation. Acne causes several types of lesions, like whiteheads, blackheads, pustules, pimples, and nodules. Acne affects people of all ages, but it is most common in teenagers and younger adults. Acne treatment products such as creams, face washes, and others are available on the market. However, the patches outperform acne creams and face washes due to two significant advantages. To help prevent the spread of bacteria and dirt, the sticker first acts as a barrier by forbidding touching or picking at the injured area. Second, the hydrogel patch absorbs the pimple's inflammatory pus while also keeping the area moist. These benefits encourage the creation of cutting-edge transdermal acne patches. This transdermal acne patch contains salicylic acid as an active pharmaceutical ingredient. Bacteria that clog pores and cause inflammation are removed.

**KEYWORDS:** Acne patch, salicylic acid, Hydrogel patch, pimples.

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### INTRODUCTION:

Acne vulgaris is a severe, self-limiting inflammatory disorder of the sebaceous unit. Cutibacterium acnes cause acne vulgaris during adolescence when dehydroepiandrosterone (DHEA) normally circulates in the blood [1]. It is a very common skin condition that typically affects the face but can also affect the upper arms, chest, and back. It can happen with both inflammatory and non-inflammatory lesions. Acne may appear during adolescence and persist until the thirties [1, 2]. Males are more prone to acne than females. More people are affected in urban areas than in rural areas. Severe acne with scarring develops in 20% of those affected. Certain races appear to be more affected than others. Africans and Asians are more likely to have severe acne, while white people are more likely to have mild acne. Hyperpigmentation is more common in people with darker skin. Although acne can appear in newborns, it usually goes away on its own. During puberty, 5-alpha reductase converts testosterone into more potent DHT, which binds to specific receptors in the sebaceous glands and increases sebum secretion. Sebum is retained as a result of the increased hyperproliferation of the follicular epidermis caused by this. The dermis becomes inflamed when distended follicles burst and release pro-inflammatory substances. C. acnes,

Staphylococcus epidermis, and Malassezia furfur are the bacteria that cause inflammation and follicular epidermal growth [3,4].

### TREATMENTS FOR ACNE:

Acne can be treated in several ways, including topically applied medications, oral medications, physical therapy, laser therapy, and photodynamic therapy. For mild to moderate acne, topical treatment is usual. Anti-bacterials like benzoyl peroxide, retinoids, and antibiotics are the mainstays of topical acne treatment. Although it can irritate the local skin, a topical treatment can stop new lesions from forming. Gels, pledges (pads soaked with medication), washes, and solutions all have the potential to dry out the skin, hence they are typically reserved for usage on oily skin types. The risk of skin irritation is heightened when using lotions, creams, and ointments on dry skin. The effects of this topical medication take at least six to eight weeks to show [1]. The aims of treatment for acne patients include reducing psychological morbidity, preventing discharge scars, and clearing up both inflammatory and non-inflammatory lesions. Therapy should be provided for at least eight months to determine if the treatment is working or not. Referral to a dermatologist is advised if the treatment's objective is not met or there is substantial scarring [8]. Erythromycin, clindamycin (CDM), and benzoyl peroxide are just a few of the antibacterial medications that have been investigated for the treatment of acne [7]. However, not all methods of administration can be successful and secure against acne. Because of their low dermal absorption, the majority of these medications do not efficiently kill microorganisms. Topical antibiotics are not recommended as the sole treatment for acne because bacterial resistance can develop. In the meanwhile, isotretinoin or oral antibiotics have shown superior therapeutic efficacy [9]. Medication for acne reduces oil production, swelling, and infection by bacteria. The patient might need four to eight weeks to see results from the majority of prescription acne medications. The full recovery from acne can take many months or even years. The course of treatment the doctor will suggest depends on age, the type and severity of acne, and the level of commitment by the patient. For example, the affected skin must be treated by washing it twice a day for several weeks. A combination of topical and internal (oral) medications is commonly used. Due to the possibility of side effects, pregnant patients have limited treatment options [1].

**Table 1: TREATMENT OF ACNE IN DIFFERENT DOSAGE FORMS [1]:**

PREPARATION	FUNCTION
GEL	Patients with oily skin are treated with gels, as they are more comfortable and have a drying effect. However, it can cause burns and prevent some cosmetics from adhering to the skin.
SOLUTION	Its main solution is used in combination with topical antibiotics dissolved in alcohol. Patients with oily skin can also use the

	solution in place of the gel.
LOTION	All types of skin can utilize lotions. On the skin with hair, the lotion spreads evenly. Propylene glycol, which typically is present in lotions and has a drying and burning effect
CREAM	Creams are meant for people with dry or sensitive skin, so the formula should not irritate or dry out the skin. Patients who use it will experience very oily skin when applying the cream if they have oily skin.

### Topical acne treatment with patches:

Pimple stickers are another name for acne patches. The translucency of the patch is designed to absorb the moisture and oil of acne. A small round sticker is filled with hydrocolloid, a gel with wound-healing properties. The hydrocolloid reacts with the oil and dirt of acne when the patch is in place, forming a gel. The patch protects the acne from infection and prevents swelling. This protective shield greatly reduces the chance of scarring. Even if the pimple is popped, an acne bandage acts like a band-aid on the blemish, preventing new bacteria from entering and making the situation worse.

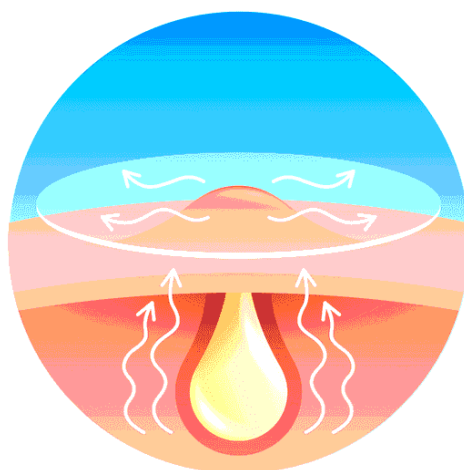


Fig.1: Working of acne patch

### How does a pimple patch work?

Pimple patches work well on acne outbreaks on the skin's surface. The patches perform effectively against blackheads and pimples with pus, but they are less effective against cystic acne. Acne patches are great for treating active bumps, but they won't prevent the problem from coming back. They can have difficulty with even blocked pores. Pimple patches are

ineffective for treating acne outbreaks with deep and cystic lesions. Most of the time, the patches just serve as little dressings to keep the pimples from getting worse. These zit stickers also wouldn't do much to help the acne. For this reason, people with severe acne should see a doctor for proper treatment. Additionally, acne patches may not be suitable for those with sensitive skin due to the potential for skin irritation from the adhesive. Adhesives may also affect the skin around lesions if the patient has an allergic reaction to them.

**Types of Pimple Patches:**

There are, generally, three types of pimple Patches that are hydrocolloids, hydrogel, and microneedles.

**Table 2: Types of acne patches:[1]**

Patches	Characteristics
<b>Hydrocolloid patches</b>	<ul style="list-style-type: none"> <li>• It has the size of a pimple and is circular in shape.</li> <li>• It is also very thin, so it is less visible when used in public.</li> <li>• It can suck moisture from the pores, prevent other infections, and prevent the formation of acne scars on the skin.</li> </ul>
<b>Hydrogel patches</b>	<ul style="list-style-type: none"> <li>• It is used in the case of active acne, active ingredients are used to kill acne-causing bacteria and reduce inflammation.</li> <li>• Salicylic acid and tea tree oil are common active ingredients in this type of acne patch.</li> <li>• It can reduce pimple bumps, pain, and redness, as well as relieve inflamed pimples such as papules.</li> <li>• It can also aid in the reduction of the size of lesions caused by nodular or cystic acne.</li> </ul>
<b>Microneedle patches</b>	<ul style="list-style-type: none"> <li>• It contains a dissolved and very fine microneedle for cystic or nodular acne.</li> <li>• It has a small needle on one side that can help to deliver and penetrate active ingredients into the deeper layers of the skin;</li> </ul>

**Method:**

The present study aim is to prepare a matrix diffusion-type transdermal controlled system comprising Salicylic acid with different ratios of hydrophilic and hydrophobic polymeric combinations at different concentrations. The transdermal patches were prepared using the Solvent Casting Technique.

**Formulation of hydrogel patch:**

A technique known as Solvent Casting Technique was used to develop transdermal patches TDD. The matrix type transdermal patches were created using the ingredients listed in table.1, with salicylic acid serving as the active ingredient. All of the ingredients are combined in various concentrations. The casting solution contained varying amounts of HPMC, Eudragit-L-100, Eudragit-S-100, PVP, methanol, and dichloromethane. Using a magnetic stirrer, accurately weighed polymers were dissolved in appropriate solvents (methanol: dichloromethane). The selected model drug (Salicylic Acid), permeation enhancer (oleic acid), plasticizer (glycerol), and moisturizing agent (hyaluronic acid) were slowly added to this solution while stirring continuously. The obtained uniform dispersion was poured into a Petri plate, and the rate of solvent evaporation was controlled by inverting the cut funnel. The patches were dried at room temperature for 24 hours before being placed in a desiccator [6].

**Table 3: Excipients used in the formulation of hydrogel patch:[6]**

Excipients	Function
(Salicylic acid) Drug	Anti-acne property
Oleic acid	Permeation Enhancer
Glycerol	plasticizer
Hyaluronic acid	moisturizing agent
HPMC	Polymer matrix
Methanol	Solvent

**Benefits of a pimple patch:**

- Prevents picking pimples.
- Protects pimples from dirt and bacteria.
- Dry the pimple without squeezing or squeezing the pimple.
- Creates a healthy environment for proper recovery and reduces the risk of scarring.

**Drawbacks of a pimple patch:**

- More expensive than conventional spot treatments.
- Does not work on all acne breakouts, only specific individual pimples.

### Conclusion:

The aim of the present study is to prepare a hydrogel acne patch (medicated) that contains salicylic acid as an active pharmaceutical ingredient because of its good anti-acne properties. Acne patches are a newly emerging technology for the treatment of acne. Recently, more people have started using this acne patch to cure different types of acne. Acne patches can increase patient compliance. In fact, nowadays most people preferred acne patches over creams and other medicines. Due to its dual use as an acne treatment and concealer, acne patches are in high demand. Acne patches are also more convenient for customers to purchase, apply, and maintain, which contributes to their high popularity.

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