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# Film Forming Spray: A Review

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**Abstract:** Film Forming Spray (FFS) is an innovative topical and transdermal drug delivery system that forms a thin, transparent, and non-sticky film upon application to the skin after solvent evaporation. This system offers several advantages over conventional topical formulations such as creams, gels, ointments, and patches, including improved patient compliance, sustained drug release, enhanced skin adherence, reduced cross-infection, and avoidance of first-pass metabolism.

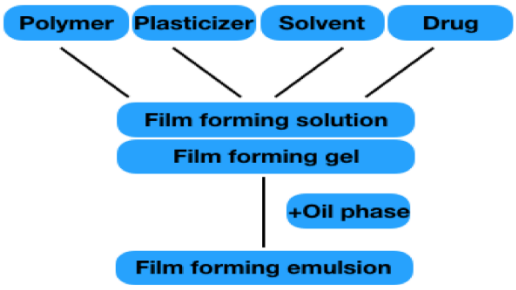
**Keywords:** Spray Formulations, Film Forming System, Topical Drug Delivery

## I. Introduction:

Topical route is used for systemic or local effect. There are various advantages of topical route like avoidance of first pass metabolism, effect of low pH and enzymes in gastrointestinal tract and large available surface area.[1–7]

Drugs administered through the topical route are often formulated in a dosage system like a patch, gel, lotion, cream, ointment or spray to enhance therapeutic efficiency or pharmacokinetic profiles. [8-10] Other semisolid preparations also have the disadvantage of being easily attached to clothing while on the move and can cause cross-infection of wounds because it is applied using the fingers. Advantages of sprays compared to other types of topical dosage are ease of use, low incidence of irritation, sterility of the dosage, good coverage of the skin or wound, even distribution of drug after application and the possibility to adjust the dosage.[11-17]

In recent decades, various innovations have continued to be developed to obtain efficient and effective spray preparations. One of them is a film-forming spray (FFS) which has been applied in multiple fields, such as the food industry, cosmetics, pharmaceuticals, plantations, etc.[18-20] FFS generally consists of active substances, enhancers, and polymers that are dissolved in organic solvents. A thin, non-sticky film forms that can increase the contact time and permeability of the drug, resulting in continuous drug release, and can prevent crystallisation so that more drug is available to provide therapeutic effects compared to other conventional topical preparations.[21]




**Film Forming System:**

One of the main challenges of pharmaceutical research is the development of new technologies to impart different features to formulations that overcome the therapeutic limitations of conventional dosage forms, such as adjustable release profiles, flexibility of use, possibility to carry more than one active ingredient and improvement of the patient's compliance. The film forming system (FFS) is a novel method that can serve as an alternative to traditional topical and transdermal formulations. It is defined as a non-solid dosage form which forms a film in situ, i.e. after application on the skin or any other body surface.These systems consist of the drug and film-forming excipients in a vehicle which forms a film of excipients and the drug on application to the skin after solvent evaporation. FFS forms supersaturated systems rapidly on skin application thus overcoming the problem of instability. Hence, it improves the transdermal delivery of drugs as compared to other transdermal formulations.

These film-forming systems (FFS) are particularly promising formulations in the dermatological field as they overcome the limitations above, and systems have also been studied for transdermal delivery of steroid hormones, analgesics, the development of mucoadhesive systems for stomach retention and as an alternative to patching, with the goal to improve drug safety and efficacy. In the area of dermatological diseases, there are also many applications, including the administration of

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antifungal agents and the treatment of burns and wounds. They also help prevent trans-epidermal water loss, thereby assisting in skin hydration and other applications of skin care products.

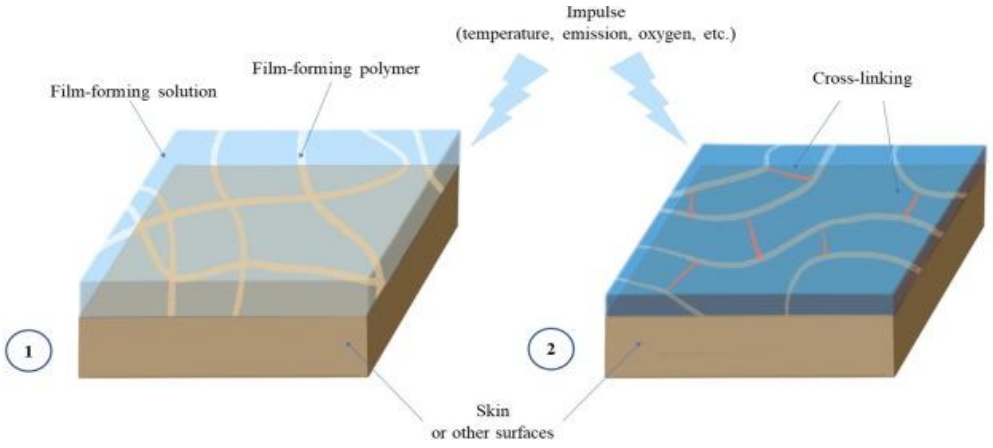


**Figure 2: Cross linking film formation mechanism**

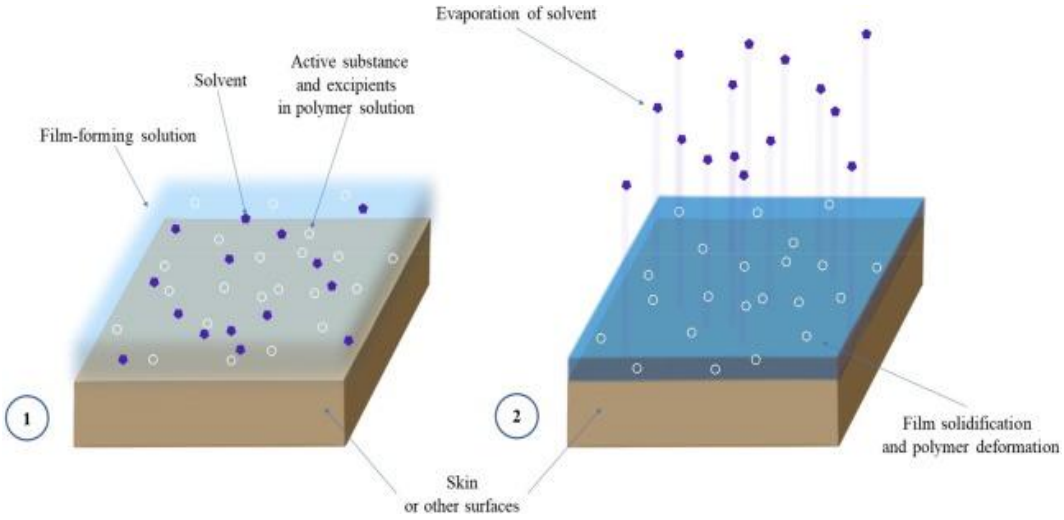


**Figure 3: Evaporation based film formation mechanism**

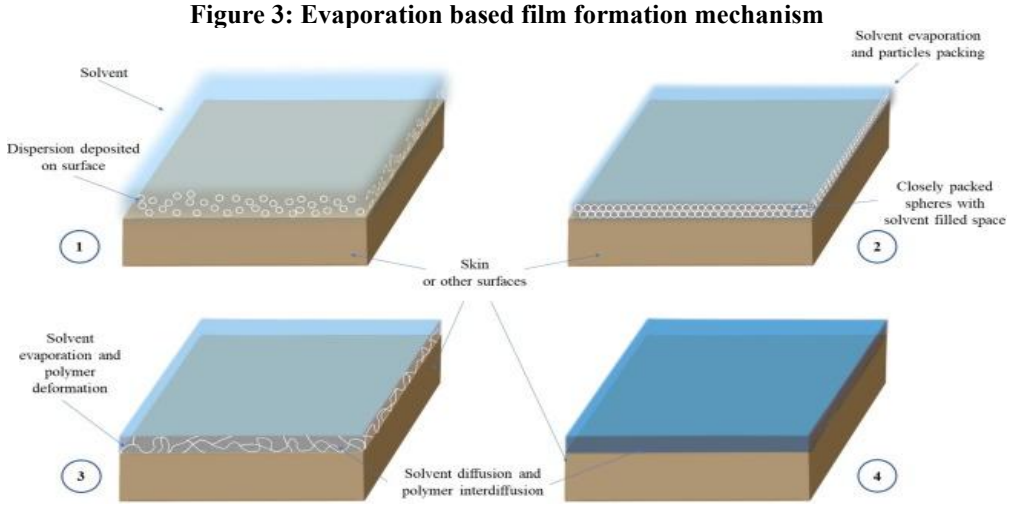

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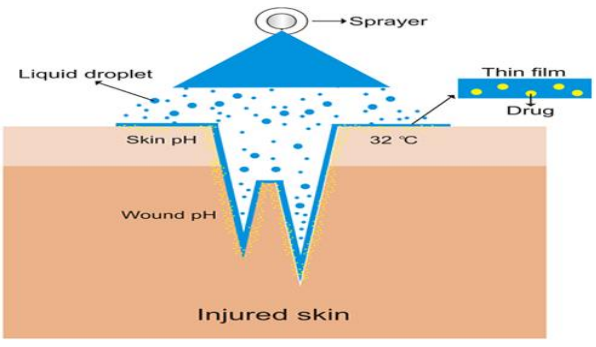
**Figure 4: Coalescence based film formation mechanism**

**Mechanism of FFS:**

An FFS is a solution drug delivery system that is sprayed, with the polymer used as a matrix for film formation, which forms a film on contact with the target therapeutic site. After the film formation, the drug release process is similar to a patch, in which the polymer matrix containing the drug will release it in1 a sustained manner. However, unlike topical patches and other topical preparations, films are formed following the pattern of the skin or wound because deep indentations can be exposed to small droplets of the film-forming solution as shown in figure below. This, of course, greatly facilitates drug access to the target tissue. Drug dosages can also be adjusted per volume of solution per spray in a spray which forms a film so that systemic or local effects can be controlled. Also, an FFS offers an even distribution of drugs and disperses well. Ease of use may also increase patient compliance.the thin film can be washed away easily with water. This thin and non-sticky film also increases patient comfort during activities compared to using patches, ointments, gels, etc. because they have a rough and sticky texture when applied. The thin film also allows the wound moisture to diffuse through to maintain the balance. Inappropriate humidity of the wound can lead to infection or irritation similar to what happens with the use of patch preparations

The film-forming fluid is sprayed using any type of sprayer to create droplets. Although the specifications and intended purposes of each sprayer vary, there is a particular potential for usage in medical applications. The many kinds of sprayers that could be utilized as drug delivery devices in film-forming systems are explained below.




**Advantages:**

- Quick drying enhanced patient adherence
- Regulated and sustained medication release
- Application without touch
- Uniform distribution of drugs
- Improved skin adherence
- Increased bioavailability
- Decreased cross-infection
- Flexible and breathable film
- Avoidance of first-pass metabolism, and ease of use with transparent
- Non-greasy and less irritating film forming systems
- Increased patient compliance
- Improved dosage flexibilityand improved appearance

**Applications:**

- Wound healing and protection
- Transdermal drug delivery
- Topical drug delivery system
- Burn and ulcer treatment
- Pain management system
- Antimicrobial and antiseptic applications
- Sunscreen and protective skin coating
- Cosmetic formulations
- Bioadhesive drug delivery system

## II. Conclusion:

The film-forming system provides a novel platform to deliver drugs both topically and transdermally to the skin. Transparency, non-greasiness, less skin irritation, wipe-off resistance, longer dwell time, increased dosing flexibility, better patient compliance, and aesthetic appeal are all benefits of these straightforward film-forming systems. Despite the fact that these systems have been the subject of extensive research, there is a dearth of information regarding their delivery efficiency. Few products are marketed as a result. Although more investigation is required to demonstrate the film-forming system's applicability as a transdermal administration method, the findings are promising for the advancement of this cutting-edge topical medication delivery technology.

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