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# Beyond Creams and Patches: A Comprehensive Review of Film Forming Systems (FFS) as Novel Platforms for Supersaturation-Driven Skin Delivery

**Amol B. Yadav[2], Asavari A. Dhaigade[1], Sanchita J. Maharnavar[1]**

[1]UG Research Group, KCT's Krishna College of Pharmacy, Karad-415110, Maharashtra, India.
[2]Department of Pharmaceutics, KCT's Krishna College of Pharmacy, Karad-415110, Maharashtra, India.

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**ABSTRACT :**

Creams, ointments, and gels are examples of conventional topical formulations that frequently have drawbacks, such as a short skin residence time, a tendency to be wiped off by clothing or washing, and decreased patient compliance because of greasy or sticky textures. One innovative solution to these problems is the Film Forming System (FFS), also known as Topical Film, which is a well-known platform for both systemic (transdermal) and local (topical) drug delivery.FFS is defined as a non-solid dosage form (solutions, sprays, gels, or emulsions) that directly forms a thin, transparent polymeric film on the skin's surface. When a volatile solvent is used, this process happens quickly by evaporation. The resultant film facilitates controlled and prolonged drug release by acting as an external reservoir or solid matrix. The formation of supersaturated systems, which raises the drug's thermodynamic activity and greatly improves drug flux across the skin barrier in comparison to other transdermal formulations, is a crucial process used by FFS.To guarantee film flexibility and adherence, formulation usually includes plasticizers (like Triethyl Citrate), specific solvent systems, and film-forming polymers (such Ethyl Cellulose, Eudragit, and HPMC). Solvent evaporation methods are the mainstay of preparation; more recent methods incorporate nanocarriers, like liposomes or solid lipid nanoparticles (SLNs), for optimal distribution. The Franz diffusion cell device is used to evaluate film thickness, tensile strength, folding durability, homogeneity of drug content, drying time, cosmetic attractiveness, and drug release/permeation profiles in order to validate optimal performance. Applications nowadays are numerous and include wound healing, pain management, and dermatological conditions (such as fungal infections and acne). FFS technology has great promise for the development of dermatic solutions that will increase patient compliance and need fewer doses.

**Keywords:** Film Forming System (FFS), *In Situ* Film Formation, Polymers (Film-Forming Agents), Supersaturated Systems, Sustained Drug Release.

## 1. INTRODUCTION TO TOPICAL FILMS

Due to its affordability, ease of use, and ability to avoid hepatic first-pass metabolism, topical medication delivery is a highly preferred method for local administration. However, conventional topical and dermatological formulations, like creams, gels, foams, and lotions, frequently have limited potency and residence time. To overcome the therapeutic constraints present in traditional dose forms, new technologies must be developed. One innovative approach in this area is the Film Forming System (FFS), also known as Topical Film.(1)

### What Topical Films (FFS) Are

A Film Forming System (FFS) is defined as a **non-solid dosage form** that produces a film *in situ*—meaning directly on the application site, such as the skin or any other body surface, after application.

1. **Application and Composition FFS:** is applied topically as a liquid or semi-solid substance, frequently in the form of emulsions, gels, sprays, or solutions. The medicine (active ingredient) and film-forming excipients are the main components of these systems, which are suspended in a volatile solvent-containing vehicle.

2. **Film Formation Mechanism:** When the volatile solvent comes into touch with the skin, it evaporates, which is the fundamental mechanism. Along with the medicine, this evaporation leaves behind a coating of excipients, including the polymer. A thin, transparent solid film is formed by the resulting polymeric layer.

**3. Film Functionality:** The resulting film can be used as either a residual liquid film that is rapidly absorbed into the stratum corneum or as a solid polymeric matrix intended for the drug's controlled or prolonged release to the skin.(2)

**4. How Topical Films Differ from Conventional Topical Dosage Forms**

**5.** Traditional topical formulations, such lotions, creams, and ointments, have a number of drawbacks that require regular reapplication. These conventional systems' short residence times in the target area and their vulnerability to being quickly washed away by water or eliminated by clothing, motions, and perspiration are among its drawbacks. Additionally, semisolid preparations can occasionally be oily and sticky, which has a detrimental effect on patient compliance.(3)

Topical Film Forming Systems, which serve as an intermediate dose form, get beyond these restrictions by providing features commonly found in both conventional semisolids and transdermal patches:

1. **Adherence and Retention:** Better skin adhesion qualities and a noticeably longer resistance time (longer retention or dwell time) on the afflicted area are provided by FFS formulations. The film's capacity to retain skin is enhanced by its ability to dry.

2. **Aesthetics and Comfort:** FFS produces a virtually undetectable film that is non-greasy and non-sticky, which significantly improves patient comfort and cosmetic acceptability in contrast to some oily and visible traditional formulations.

3. **Durability and Dosing:** FFS offers wipe-off resistance, which is a benefit that semisolids frequently lack. Compared to semisolids, which generally call for administration once daily or less frequently, this adherence and permanence enable a lower dose frequency (usually 1-2 days).

4. **Why Topical Films are Considered a Novel Drug Delivery System**

Because it uses a special method to get beyond important pharmacological and physiological obstacles and provide therapeutic improvements beyond traditional formulations, the Film Forming System is categorized as a Novel Drug Delivery System (NDDS).(4)

1. **Overcoming Therapeutic Limitations:** A unique framework for creating dermatological products with prolonged release is offered by FFS. It tackles important issues in pharmaceutical research, including the requirement for flexible use, improved patient compliance, and changeable release profiles.

2. **Enhanced Drug Penetration:** Drug instability problems are resolved when FFS is applied because it quickly produces supersaturated systems as the volatile solvent evaporates. When compared to conventional transdermal delivery systems, this supersaturation greatly improves medication penetration (flux) into the skin by raising the thermodynamic activity of the formulation without compromising the skin's barrier function.

3. **Targeted and Sustained Delivery:** The resulting film functions as an external reservoir or polymeric matrix, controlling the drug's delivery to the skin and allowing for a prolonged and improved penetration profile with fewer applications. This enables FFS to administer medication for systemic absorption (transdermal delivery) or localized therapy of cutaneous conditions or wounds (topical delivery).

4. Therefore, FFS is a novel and promising platform for drug delivery to the skin, enabling reduced skin irritation, increased dosage flexibility, and improved drug release kinetics.(5)

**2. Materials Used in Topical Film Formulation**

The choice and ratio of the materials that make up a Topical Film Forming System (FFS) are crucial to its development. These materials can be broadly categorized as the drug, the film-forming polymer, the solvent system (which includes both volatile and non-volatile vehicles), plasticizers, and additional excipients like penetration enhancers.(5)

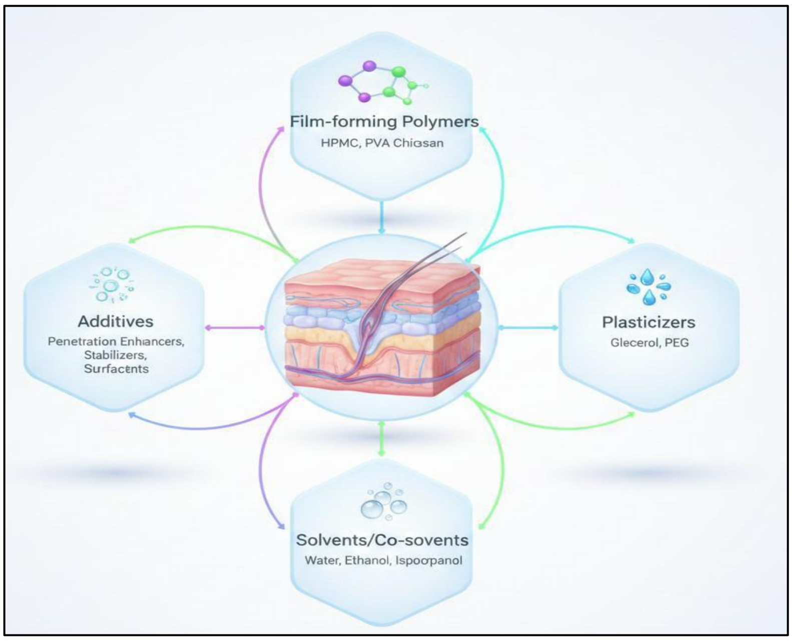


**Fig.no.1: Materials Used in Topical Film Formulation**

**2.1. Drug Incorporation and Selection**

- Regardless of the dose form, the Active Pharmaceutical Ingredient (API) must have the right physicochemical characteristics to effectively penetrate the skin. The following qualities are ideal for medication compounds intended for topical or transdermal distribution via FFS:

- **Molecular Weight:** The drug molecule should typically have a molecular weight of **less than 500 Daltons**.

- **Lipophilicity:** The octanol-water partition coefficient (Log P) of a drug should ideally be between 1 and 3, indicating sufficient lipophilicity. Within this region, increasing lipophilicity is typically linked to increased skin permeability.

- **Solubility and Concentration:** To enable large drug loadings and create a sizable concentration gradient between the formulation and the skin, which promotes improved permeability, the drug must be highly soluble in the final formulation.

- **Stability and Tolerance:** The medication should not irritate the skin and be somewhat stable against the enzymes found in the epidermis. Highly acidic or alkaline medications are typically not appropriate for topical administration.

- In order to effectively incorporate the drug substance into the thin film formed in situ, the formulation process frequently attempts to dissolve the drug substance in the film-forming vehicle.(6)

**2.2. Film-Forming Polymers**

The basis of FFS is made up of polymers, which, upon solvent evaporation, produce a polymeric matrix or solid layer on the skin that regulates the drug's controlled or prolonged release.

**Key Requirements for Polymers:**

1. **Film Properties:** The polymer must be able to form a **flexible, thin, transparent, and resistant film**.

2. **Temperature Dependency:** It should be required to form films at typical skin surface temperature, ranging from 28 °C to 32 °C.

3. **Aesthetics and Adhesion:** A non-sticky coating and improved patient comfort are the results of polymers' exceptional flexibility, elasticity, and superior adherence.

4. **Anti-Crystallization:** Some polymers function as crystallization inhibitors or anti-nucleating agents, keeping the medication in a supersaturated state that improves penetration and inhibits precipitation upon solvent evaporation.(7)

5. **Classification of Polymers:**

The polymers used can be classified based on their interaction with water:

○ **Water-Insoluble (Hydrophobic) Polymers:** These polymers are useful because they produce films with high substantivity (extended residence time) that are resistant to water. However, in order to produce adequate adhesion and flexibility, plasticizers are generally required because they are brittle and rigid.

○ *Examples include:* **Ethyl Cellulose (EC)**, known for being non-toxic, non-irritating, and forming tougher films; **Eudragit** polymers (e.g., RS 100, RL 100, NE), which are polymethacrylate copolymers known for being transparent, elastic, self-adhesive, and demonstrating good adhesion to the skin; and **Silicones** such as Polydimethylsiloxane (PDMS), which form durable and water vapour-permeable films.(8)

2. **Water-Soluble (Hydrophilic) Polymers:** They are perfect for formulations meant for quick drug penetration into the stratum corneum, but their hydrophilic nature usually makes them inappropriate on their own for establishing a long-term drug reservoir inside the formulation.

○ *Examples include:* **Hydroxypropyl Methylcellulose (HPMC)**, which produces a light, non-greasy film with good texture; **Polyvinyl Alcohol (PVA)**, valued for its excellent film-forming and adhesive properties; and **Chitosan**, which exhibits excellent film-forming ability and enhances drug permeation by opening mucosal membrane tight junctions.(9)

**2.3. Solvents**

Because it affects the drug and polymer's solubilization, the film's formation kinetics, and the effectiveness of drug penetration, the solvent system is an essential part of FFS.

**Solvent Requirements:**

1. **Volatile Nature:** To reduce drying time and increase patient compliance, solvents must be extremely volatile and evaporate rapidly at skin surface temperature (preferably producing film development in less than one minute). During the evaporation process, they should not cause skin irritation.

2. **Solubilization:** The solvent must effectively dissolve the drug and adequately disperse or dissolve the film-forming polymer.

3. **Aesthetics:** Solvents must facilitate good spreading on the skin to form a uniform film with smooth thickness.(10)

**Types of Solvents:**

• **Volatile Solvents:** The polymer and medication remain after these elements evaporate, forming the film. Examples include butanol, ethyl acetate, and ethanol and isopropanol, which are thought to be good solvents for FFS.

1. **Non-Volatile Components (Vehicles):** FFS frequently uses a solvent system made up of mixed volatile and non-volatile components, especially in solutions and sprays. The main purposes of the non-volatile component are:

2. **Preventing Precipitation:** They keep the medication from precipitating or solidifying as the volatile solvent evaporates.

3. **Penetration Enhancement:** In order to aid the drug partition into the epidermis and increase drug diffusivity by upsetting the ordered intercellular lipids, they must quickly partition into the stratum corneum. Examples of substances that improve penetration without evaporating are isopropyl myristate and propylene glycol.(11)

**2.4. Plasticizers**

Plasticizers are essential excipients required in most FFS formulations to mitigate the **brittle nature and inflexibility** often exhibited by dry polymer films.

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**Mechanism and Purpose:**

1. **Increasing Flexibility:** Plasticizers interact with functional groups by penetrating the gaps between the polymer chains. By reducing the intermolecular forces between polymer chains, this interaction weakens the bonds and greatly increases the film's flexibility. In order to maintain strong adhesion and avoid film detachment, the film's increased flexibility is essential for accommodating skin movements, particularly around joints like the elbows.

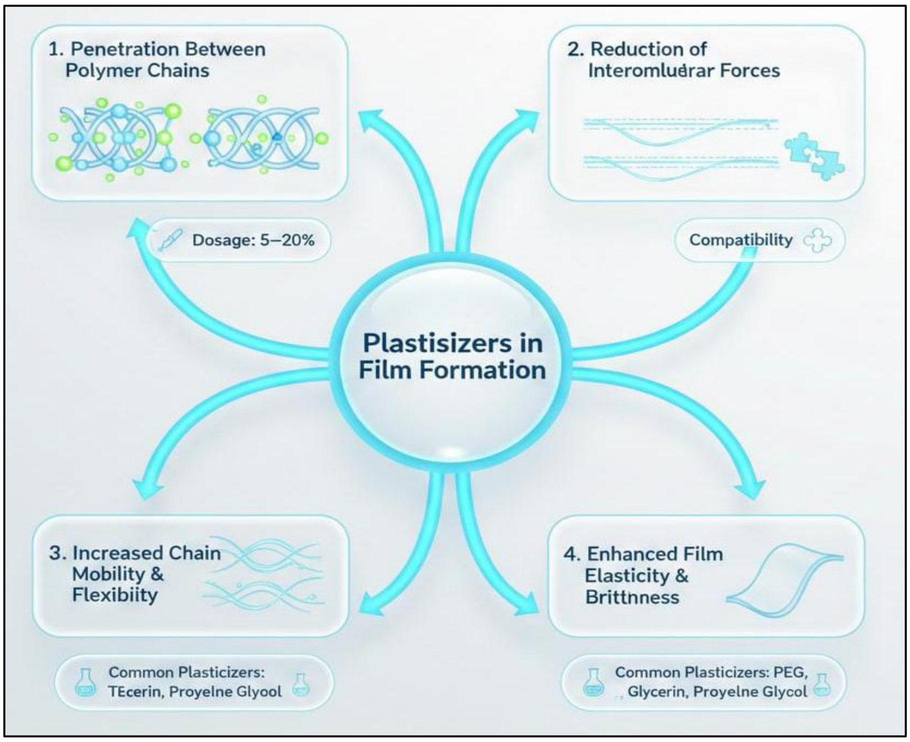


**Fig.no.2: MOA Of Plastisizers In FFS**

2. **Dosage:** Generally speaking, the ideal plasticizer content ranges from 5% to 20% of the formulation's total dry weight. Excessive amounts can produce sticky films, while insufficient amounts can produce brittle films with poor adherence.

- **Compatibility:** To avoid leakage, which could otherwise degrade the film's qualities, they must be compatible with the selected polymers and ideally have minimal skin permeability.

- *Commonly used plasticizers include:* **Triethyl Citrate (TEC)**, **Glycerine** (Glycerin), **Polyethylene Glycol (PEG)**, **Propylene Glycol**, Sorbitol, and Dibutyl phthalate.(12)

**2.5. Penetration Enhancers and Further Excipients**

Penetration enhancers (PEs) are used to topical formulations to increase medication transport through the skin by lowering the stratum corneum barrier's resistance. They accomplish this by increasing the skin's permeability in a reversible manner without permanently harming living cells.

**Types of Penetration Enhancers:**

- **Chemical Enhancers:** These substances partition into and engage with the elements of the skin. PEs, such as sulfoxides, alcohols, polyols (such as glycols), fatty acids, amides, surfactants, and terpenes, are categorized chemically according to their functional groups and structures.

- *Examples include:* Terpenes such as **menthol** and **camphor**, Azone analogues, and Dimethylsulfoxide (DMSO). Certain non-volatile solvents, like Propylene Glycol and Isopropyl Myristate, also exhibit penetration-enhancing characteristics.(13)

**Further Excipients:**

Depending on the FFS dosage form (solution, spray, gel, or emulsion), other excipients may be necessary:

- **Gelling Agents** are essential for film-forming gels.
- **Propellants** are required for aerosol spray systems.
- To modify the formulation for certain application areas, including wound surfaces, where non-isotonic medications could cause irritation or pain, **pH Corrigent**s (buffer solutions) and Tonicity Modifiers (e.g., dextrose, mannitol) may be added.(14)

**3. Mechanism of Drug Release and Skin Penetration**

The Film Forming System (FFS) works by creating a drug-loaded film in situ when it is applied, then releasing and penetrating the active pharmaceutical ingredient (API) into the skin under regulated conditions.(7)

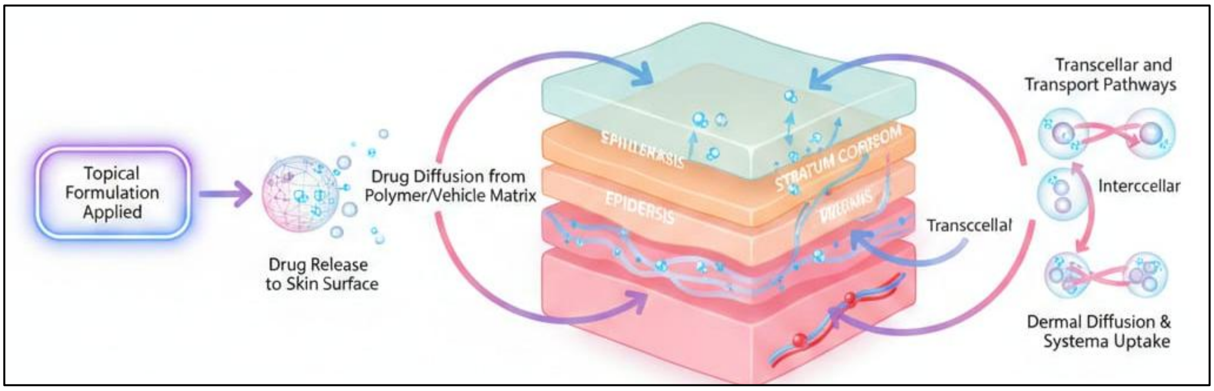


**Fig.no.3: Mechanism of Drug Release and Skin Penetration**

**3.1. Film Formation and Adhesion Mechanism**

The FFS is applied to the skin as a liquid solution, spray, or semi-solid formulation. This preparation contains the drug, film-forming polymers, and a volatile solvent system.

1. **Solvent Evaporation:** The extremely volatile solvent must evaporate when it comes into contact with the skin's surface, which is usually between 28 and 32 degrees Celsius. The film should ideally develop in less than a minute as a result of this quick evaporation process.

2. **Formation of the Film Matrix:** The polymer, medicine, and non-volatile excipients solidify or condense as the volatile solvent evaporates, forming a thin, transparent residual polymeric film right on the application site.

3. **Adherence and Flexibility:** This created film sticks firmly to the skin's surface, enhancing the formulation's substantivity—the ability of the active ingredient to be retained at the site of action—and offering robust adhesion for continuous medication distribution and absorption. The film must maintain high flexibility to allow for the skin's natural movements in order for the FFS to maintain full skin contact throughout the application region.(15)

**3.2. Drug Release Mechanism (Supersaturation and Sustained Delivery)**

The concentration of the medication in the leftover residue film considerably rises when the volatile solvent evaporates.

1. **Supersaturation:** On the skin's surface, the concentration can approach a saturation level and possibly a supersaturation level. Compared to alternative transdermal dosage forms, Film Forming Systems specifically produce supersaturated systems right after application, which eliminates potential drug instability issues and promotes better drug absorption.

2. **Enhanced Drug Flux:** The drug's thermodynamic activity within the formulation is exactly proportional to the flux, or rate of drug permeation, according to the modified Fick's equation of diffusion. FFS improves the drug's movement (flux) over the skin without impairing the skin's barrier function by raising its thermodynamic activity through supersaturation, which lowers the possibility of adverse effects or irritation.(16)

3. **Sustained Release Reservoir:** The resulting film serves as an external drug reservoir or a solid polymeric matrix that restricts and controls the drug ingredients' constant supply and release to the skin. The development of sustained-release dermatic drugs and improved penetration with less frequent dosing—typically once daily—are made possible by this controlled release mechanism.(16,17)

### 3.3. Pathways of Skin Penetration

Drug molecules must pass through the layers of the skin, especially the stratum corneum (SC), which is the outermost layer and acts as the primary barrier, in order to produce a therapeutic response, whether local (topical) or systemic (transdermal).

**Drug penetration through the skin layers can occur via three principal pathways:**

1. **Transepidermal Routes (Through the SC):** This is the **dominant pathway** for drug transport through the skin and includes two sub-routes:

○ **Intracellular (Transcellular) Route:** The medication enters the corneocytes—dead, keratinized epidermal cells—directly. The main route for very hydrophilic medications is this pathway, which contains highly hydrated keratin.

2. **Intercellular Route:** Through the intricate, highly lipophilic lipid bilayer matrix (made up of ceramides, fatty acids, and cholesterol), the medication diffuses between the corneocytes. In general, lipophilic medications prefer this pathway.

3. **Transappendageal (Shunt) Route:** By entering through skin appendages, such as sweat glands or hair follicles (which are connected to sebaceous glands), the medication avoids the stratum corneum. Although this route allows for larger molecules and provides a shorter pathway for systemic circulation, its overall contribution to drug flux is typically regarded as negligible due to the small diffusional area, though it may be significant for ions and large polar molecules at short times before steady-state diffusion is established.(18)

4. The medication enters the very capillary-rich dermal papillary layer (dermis) after passing through the viable epidermis and the SC. The medication can be delivered transdermally by entering the systemic circulation through the superficial skin capillaries. The medication may stay inside the stratum corneum and epidermis of the skin for topical action in order to reach its local target. When desired, FFS technology can offer systemic (transdermal) or local (topical) effects.(19)

## 4. Preparation Techniques of Topical Films

Film Forming Systems (FFS) are produced using a variety of manufacturing procedures, which are frequently classified according to the physical condition of the final dosage form (solution, gel, or emulsion) that is applied. For improved performance, nanotechnological approaches are increasingly being used. FFS formulations are defined as non-solid dosage forms that, when applied to the skin, quickly evaporate a volatile solvent to form an in situ film.(19,20)

### 4.1. Preparation of Solvent-Based Systems (Solutions, Sprays, and Casting)

- Dissolving the medication and the film-forming polymer in a suitable solvent system (including volatile and non-volatile carriers) is the typical method for creating film-forming solutions and sprays.

- **Solvent Evaporation / Casting:** This method underlies the spontaneous formation of the film on the skin. For large-scale manufacturing and in preparation for laboratory **evaluation** of mechanical properties, polymeric films are often produced using a **solvent evaporation technique**. This involves casting the prepared solution onto a flat surface, such as a Teflon plate, and allowing it to dry, often for an extended period (e.g., 72 hours) at room temperature.

- **Solutions/Sprays:** The film on the skin forms spontaneously thanks to this process. Polymeric films are frequently made utilizing a solvent evaporation approach for large-scale manufacture and in advance of laboratory testing of mechanical properties. This entails casting the prepared solution onto a flat surface, such as a Teflon plate, and allowing it to dry, often for an extended duration (e.g., 72 hours) at room temperature.(21)

### 4.2. Preparation of Film-Forming Gels

Film-forming gels utilize specific preparation methods to achieve their desired consistency and *in situ* film formation:

- **Dispersion Method:** This is a popular technique that involves entirely dispersing the polymer in a liquid (such as ethanol) and allowing it to swell, usually for a full day. The drug solution is then fully combined with the resulting polymeric solution or dispersion. Gels can be formed by a variety of processes, such as simple mechanical dispersion, chemical reactions, or temperature changes.(21,22)

### 4.3. Nanotechnology-Assisted Film Preparation

Modern nanotechnology-assisted methods focus on incorporating drug-loaded nanocarriers into the FFS precursor formulation, ensuring prolonged and enhanced drug release.

- **Solid Lipid Nanoparticles (SLNs):** SLNs are progressive lipid-based nanocarriers that can be added to transdermal systems. They are usually between 50 and 1000 nm in size. Ultrasound methods and high shear homogenizers can be used to prepare them. Aerosolization of fluid SLN dispersions is a different method of preparation.

- **Liposomes (Thin-Film Hydration Technique):** The thin-film hydration technique (Hand Shaking Method) is commonly used to create liposomes, which are useful for encasing hydrophilic and lipophilic compounds. To make a thin, solid film, this entails dissolving the required lipids and surfactants in a volatile organic solvent (like chloroform) and then using a rotary evaporator to evaporate the solvent. To create the liposomes, the dried film is then rehydrated with an aqueous phase (the drug solution) while being gently stirred.

- **Liposomes (Reverse Phase Evaporation Technique):** This process creates a water-in-oil emulsion by first dissolving cholesterol and surfactant in a mixture of organic solvents and then combining it with an aqueous medication solution. The final niosomes are created by further hydrating and sonicating the semi-solid gel of big vesicles that is obtained from drying the emulsion at 40 °C using a rotary evaporator.

- To maximize the formulation's properties, including drying time, film flexibility, and even distribution of the film throughout the application surface, these preparation methods are constantly improved.(22,23)

## 5. Evaluation Parameters of Topical Films

Film Forming Systems (FFS) must be rigorously characterized using a set of evaluation criteria in order to be designed and implemented successfully. These tests are categorized to evaluate the film's biological safety, pharmacological efficacy, and physical integrity.

### 5.1. Evaluation of Film Physical and Mechanical Integrity

1. **Film Formation and Cosmetic Appearance:** The preparation's successful transformation from a non-solid liquid to a film in situ is confirmed by this preliminary evaluation. For analysis, films can be made on removed pig ear skin or on a Petri dish. The presence or lack of film-forming polymer precipitation is noted when the film-formation is qualitatively assessed as either complete and uniform or incomplete and non-uniform. The visual evaluation of cosmetic factors—which are crucial for patient acceptance—notes whether the film is sticky or dry, transparent or opaque, and peelable or non-peelable.

2. **Thickness:** The thickness of the finished film is a crucial evaluative factor. Films produced by solvent evaporation on a plate are cut into samples and their thickness is measured using specialized instruments like a digital micrometer or a digital vernier caliper. Measurements are typically taken at multiple points, including the center and four corners, in order to calculate the mean thickness.

3. **Film Flexibility and Folding Endurance:** In order to accommodate skin movements and avoid adhesion loss, the film's flexibility is essential. When the skin is stretched in many directions (e.g., two or three directions), flexibility is assessed based on cracking and skin fixation. If there is no evidence of cracking or fixing, a film is deemed flexible. The film's ability to withstand rupture is measured quantitatively by folding endurance. A cut strip of film is manually folded repeatedly at the same location until it breaks; the number of folds is noted as the value.

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4. **Tensile Strength and Elongation:** These mechanical characteristics are evaluated on films that are usually created on a Teflon surface by solvent evaporation. A tensile tester is used to measure % elongation and tensile strength. Tensile strength ($\sigma$) can be computed analytically by dividing the cross-sectional area ($A$) by the maximum load applied at the break point ($F_{max}$) ($\sigma = F_{max} / A$). The amount that the film extends before breaking is measured by percentage elongation.(24)

**5.2. Pharmaceutical Performance and Safety Studies**

1. **Drug Content:** This test guarantees that the medication material is evenly distributed throughout the final formulation (like gel) or the resulting dry film. A weighed sample of the formulation or separated film is dissolved in an appropriate solvent (such as phosphate buffer solution) to measure the content. Filtration and spectrophotometric analysis are then performed at the drug's maximum wavelength ($\lambda_{max}$).(25)

2. ***In Vitro* Drug Release (Diffusion Studies):** These investigations forecast the drug's in vivo penetration properties. A Franz diffusion cell or a comparable laboratory-assembled device is used to determine the drug release profile from the film-forming mechanism. After applying the film or formulation to the donor compartment, a semi-permeable membrane (such as egg membrane or cellophane) separates it from the receptor compartment, which contains diffusion medium such as Phosphate Buffered Saline at $37 \pm 0.5 \text{ }^\circ\text{C}$. Spectroscopic analysis is used to determine the drug release from samples that are periodically taken from the receptor phase.

3. ***Ex Vivo* Permeation Studies:** These investigations are conducted to specifically evaluate the effect of the **skin barrier** on the drug delivery system. The process involves mounting excised skin (e.g., rat skin) in a Franz diffusion cell, ensuring the stratum corneum faces the donor compartment where the film is applied. The purpose of these studies is to specifically assess how the epidermal barrier affects the drug delivery system. In order to apply the film, excised skin (such as rat skin) must be mounted in a Franz diffusion cell with the stratum corneum facing the donor compartment.(25)

4. **Skin Penetration Studies:** The goal of this process is to measure how much medication permeates the layers of skin. After applying the mixture to the skin, the remaining film is gently removed with cotton pads at pre-arranged intervals. The amount of drug that entered the skin is computed by deducting the amount of drug that was initially administered from the amount of drug that remained in the pads, which is then analyzed.

5. **Skin Irritation Studies (Local Effect):** This study evaluates the safety and compatibility of the formulation, usually using animal models (e.g., rats), and is considered an obligatory characteristic. Erythema and oedema are examples of indications of irritation that are routinely checked for at the application site. The results are scored using a method that is frequently compared to a positive control (standard irritant).

6. **6. Applications and Future Perspectives**: Overcoming the drawbacks of traditional formulations, Film Forming Systems (FFS) provide a flexible platform for administering medications for both local and systemic effects.

7. Film Forming Systems (FFS) offer a versatile platform for delivering drugs for both local and systemic effects, overcoming the shortcomings of conventional formulations.(26)

**Current Therapeutic Uses:**

FFS has found numerous applications in the dermatological field.

1. **Dermatological/Antifungal Applications:** FFS is used to treat certain disorders like acne and pimples as well as dermatological illnesses, including antifungal applications. Terbinafine hydrochloride solutions or voriconazole film-forming spray are two examples of fungal infection therapies.(27)

2. **Pain Management and Anti-inflammatory:** FFS are used to treat pain and provide analgesics transdermally. There are commercial goods that use film-forming technology, like those that contain NSAIDs (non-steroidal anti-inflammatory medicines).

3. **Wound Healing:** For the treatment of wounds, FFS is especially promising. Tissue glues for sealing surgical wounds have been made from film-forming solutions or gels, such as those based on synthetic polymers like cyanoacrylates or natural ones like fibrin. They can contain antibacterial medicines to prevent infections and aid in the healing of wounds.

4. **Hormone Delivery:** Steroid hormone transdermal administration systems have also been investigated. Testosterone film-forming sprays are commercial examples.(28)

**Future Perspectives:**

The film-forming device offers a new way to apply topical and transdermal medication to the skin. It is expected that this technology will continue to advance, and further research will be required to completely determine its delivery effectiveness as a transdermal dose form. Because of its many advantages, such as increased patient compliance and dosage flexibility, FFS technology is positioned as a key component of upcoming pharmaceutical breakthroughs.(29,30)

**Conclusion:**

- In comparison to traditional formulations, Film Forming Systems (FFS) offer a novel platform for topical and transdermal delivery. Key advantages of this technology include transparency, non-greasiness, wipe-off resistance, increased adherence, and more flexible dosing. In order to fully realize its therapeutic potential and optimize patient compliance, FFS is still a promising field for future research.

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