Healthcare Solutions

DUPONT™

DuPont™ Liveo™ BIO-PSAs enable development of new topical patch for treatment of local pain

Case study: Drossapharm AG relies on DuPont pressure sensitive adhesive expertise and products to develop LIXIM® Patch with etofenamate

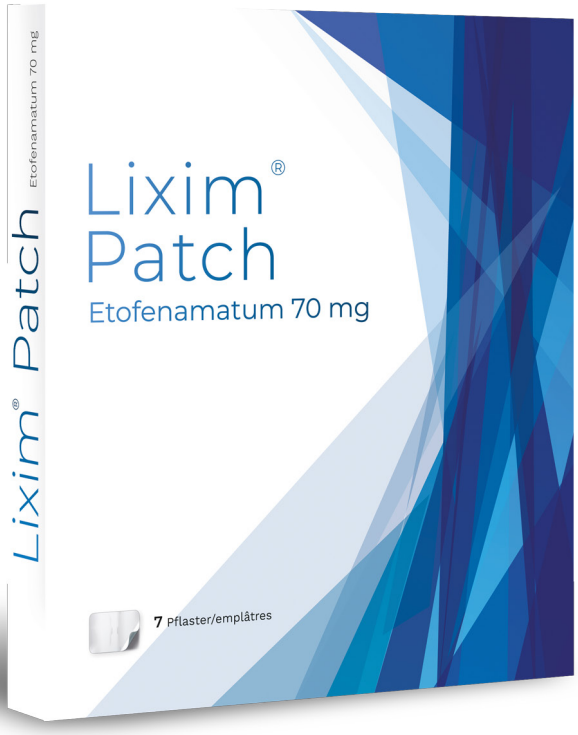

Image courtesy of Drossapharm AG

Challenge leads to opportunity

Prescribed extensively throughout the world, non-steroidal anti-inflammatory drugs (NSAIDs) are used for their analgesic, antipyretic and anti-inflammatory properties and are among the most-prescribed drugs. The global NSAID market was USD $15.58 billion in 2019 and is projected to reach USD $24.35 billion by 2027 – a CAGR of 5.8% during the forecast period.

Etofenamate is an NSAID with unique physicochemical properties, allowing for long-lasting, low-level systemic exposure following cutaneous administration. It is used to treat mild to moderate pain that arises from a wide range of conditions, such as blunt sports injuries like sprains, strains and contusions; lumbago; bursitis; myositis; periarthropathia humeroscapularis; tendovaginitis; and rheumatic diseases.

Dermal (local) drug delivery has the advantage of achieving sufficiently high drug levels at the site of therapeutic action while keeping systemic blood levels low, thus avoiding side effects and improving drug therapeutic index. Because they can cause gastrointestinal, renal and cardiovascular disturbances when administered systemically, dermal delivery of NSAIDs can be highly advantageous.

Drossapharm AG sought to bring to market an effective solution to overcome some limitations presented by existing semisolid dosage forms.

LIVEO™

Differential evaluation of patches versus other dosage forms for topical application

Patches generally are regarded as advanced drug delivery systems whose structure and composition are fundamentally different from those of conventional semisolid dosage forms and whose design characteristics are specifically geared towards controlled, sustained drug delivery with minimized application frequency. Drossapharm has built a strong expertise in topical drug delivery and values the unique benefits of patch solutions.

Compared to semisolid topical dosage forms such as gels, creams or ointments applied to the surface of the skin for local disease treatment, patches provide several benefits:

- **Controlled surface area of application:** Patches are manufactured with a defined surface area and applied as such to the skin. On the contrary, semisolid forms may be spread over a variably sized area of the skin that cannot be controlled, as it depends on the discretion of the individual patient.
- **Controlled drug amount per application:** A patch of a specific size is manufactured to contain an exactly measured amount of active ingredient. On the contrary, the applied amount of any semisolid product – and, thus, the amount of active ingredient applied – is subject to both interindividual and intraindividual variability, as no fully standardized method for measurement (e.g., the quantity of product squeezed out of a tube) exists.
- **Application procedure independent of individual manipulation:** No specific manipulation is required for applying a patch to the skin. On the other hand, individuals may spread a semisolid product to the skin by applying varying pressure for a varying length of time, as this application procedure defies standardization.
- **No or minimal alteration of the formulation for the duration of application:** Patches are made of laminates of polymer membranes and adhesives enclosed by a backing membrane, whose composition and structure typically do not change in the course of application. On the other hand, semisolid topical products usually contain considerable amounts of volatile components (e.g., water) and are open to the atmosphere after application, so their composition and structure are likely to change unpredictably due to evaporation.
- **Controlled, highly reproducible amount of drug delivered:** All of the aforementioned factors are known to affect drug delivery and, as a result, the amount of drug actually delivered by semisolid dosage forms; therefore, their safety and pharmacologic effect are subject to variability, whereas patches provide tightly controlled efficacy and drug safety profile.

Image courtesy of Drossapharm AG

A collaborative partnership

The collaboration between Drossapharm and DuPont was considered carefully. In looking for a partner, Drossapharm needed to find the right expertise, the right support and the right product.

Why DuPont?

Drossapharm selected DuPont for its expertise in the medical and pharmaceutical space, the DuPont™ Liveo™ product quality, and the technical support. DuPont's experts provided deep insights into the structure and properties of the pressure sensitive adhesive (PSA) polymers, enabling Drossapharm to target the release of etofenamate from the patch to develop its LIXIM® Patch for a 24-hour application.

The Liveo™ expert technical team supported Drossapharm by developing a Liveo™ BIO-PSA silicone adhesive solution that aligned with agreed-upon, targeted, critical-to-quality criteria, and the team invested time in understanding Drossapharm's process conditions to develop the right specifications. In addition, excellence in historical data documentation by Liveo™ aided in the formulation and process development. DuPont also provided regulatory support before and during the marketing authorization approval process of the Drossapharm LIXIM® Patch.

"The provided technical file was of excellent quality and did not lead to queries from the competent authorities," said Drossapharm Head of Pharma Development Dr. Roger Imboden.

Why a silicone adhesive?

Drossapharm evaluated several adhesive options and shortlisted Liveo™ Silicone BIO-PSAs because silicones, especially PSA silicones, are known to have very low skin irritation and sensitization potential. Three Phase I, one Phase II and three Phase III clinical trials with the LIXIM® Patch confirmed this; the patch was very well-accepted. Also, PSA silicones enable the development of water-free matrix systems, which have excellent skin adhesion properties – even during sweating or showering – due to their high flexibility in combination with a suitable backing.

The result

The Drossapharm LIXIM® Patch is a very flexible 140 cm^2 NSAID patch with excellent skin adhesion properties. It is designed for a 24-hour application – even over joints. The LIXIM® Patch has been shown to be clinically effective and well-tolerated.

Drossapharm obtained market approval for the introduction of the patch and is in the process of launching it in Europe. In addition, Drossapharm is looking for partnerships for markets outside of Europe.

Liveo™ BIO-PSA silicone adhesives

Liveo™ BIO-PSAs are pressure sensitive adhesives specifically for pharmaceutical use. These adhesives are permeable to many drugs and excipients and are designed to adhere drug-loaded systems to the skin.

Liveo™ BIO-PSAs are viscoelastic compounds based on the resin-in-polymer concept. They are produced by condensing silanol end-blocked polymer with a silicate resin in the presence of ammonia.

Selected features, advantages and benefits of Liveo™ BIO-PSAs include:

- Compatible with a wide range of drugs, skin permeation enhancers and excipients
- Can be formulated to provide various rates of drug permeability through the skin for controlled release
- Non-sensitizing and non-irritating
- Customized adhesion
- Customized solvent options
- Drug master file (DMF) on record with U.S. Food & Drug Administration

Consistent product quality is ensured by manufacturing at DuPont's FDA-registered, ISO 9001:2015-certified Healthcare Industries Materials Site (HIMS) in the U.S.

Over several decades, DuPont has pioneered and become the market leader in silicone-based adhesives for patches.

"Transdermal and topical markets are strategic for DuPont across the globe," said Liveo™ Global Marketing Manager Jennifer Gemo. "DuPont experts help customers develop the right adhesive solutions to meet the specific requirements of their target application, actives and patch design."

About Drossapharm AG

Drossapharm AG is an independent, family-owned pharmaceutical company specializing in the development, production and marketing/distribution of innovative anti-inflammatory and antiseptic semisolid dosage forms in different treatment areas since 1976. The innovative, quality-oriented, trusted pharmaceutical company has its headquarters, a development lab and a production site in Switzerland's Basel Area, from which the company oversees its international operations and global collaborations. Learn more at **drossapharm.ch**.

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About DuPont™ Liveo™ Healthcare Solutions

DuPont™ Liveo™ is a globally recognized leader in technology for a broad range of innovations in medical devices, biopharmaceutical processing and pharmaceutical solutions. DuPont high-performance materials help create safer healthcare environments and protect the health of patients and healthcare providers worldwide. We help enable smarter healthcare and positive patient outcomes.

For more information about Liveo™ Silicone Transdermal Adhesives

Visit **liveo.dupont.com** – or scan the QR code immediately below to be taken directly to the Liveo™ Silicone Transdermal Adhesives web page.

Image courtesy of Drossapharm AG

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To learn more about DuPont™ Liveo™ Healthcare Solutions, visit **liveo.dupont.com**.

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Smarter Healthcare.
Positive Patient Outcomes.

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