TECH OFFER

Advanced Self-Assembly Hydrogel Drug Delivery Platform for Chronic Skin Conditions and Pharmaceutical APIs

KEY INFORMATION

TECHNOLOGY CATEGORY:
Healthcare - Pharmaceuticals & Therapeutics
Healthcare - Medical Devices

TECHNOLOGY READINESS LEVEL (TRL): TRL5
COUNTRY: SINGAPORE
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OVERVIEW

This novel technology introduces a breakthrough self-assembly porous hydrogel platform that revolutionizes drug delivery, going far beyond the limitations of traditional static creams and non-porous emulsions. The unique porous hydrogel structure demonstrates an 85% increase in drug bioavailability through enhanced penetration and controlled release, compared to traditional formulations that create impermeable barriers. The innovative one-step drug delivery system achieves a 20-fold reduction in manufacturing costs by eliminating multiple complex steps typically required in conventional processes, such as vehicle manufacturing, formulation and purification. Through its distinctive porous architecture, this streamlined approach delivers enhanced therapeutic outcomes while maintaining production efficiency.

Especially on eczema, this technology represents a breakthrough in treatment by addressing the multifactorial nature of the disease. Traditional eczema therapies typically target only one or two aspects of the condition, often leading to limited efficacy and undesirable side effects. In contrast, this delivery method enables the simultaneous modulation of several key

pathological pathways. It specifically targets inflammation, oxidative stress, proteasome dysfunction, and ferroptosis while also enhancing skin barrier function—critical factors in both the onset and persistence of eczema. This potentially reduces flare-ups and improves overall skin health.

This technology is applicable as an over-the-counter advanced topical formulation and as injectables. The technology provider is seeking the following collaborations:

- Co-development opportunities
- Patient centric non-profit organisations to support life-changing treatments.
- Dermatology focused clinics
- Formulation focused CRO/CDMO working on complex medicines
- Startup companies working on new modalities or novel API including oligo medicines
- AI/ML-driven drug discovery firms. Leverage predictive modeling to optimize key properties, such as porosity and drug loading ratios

TECHNOLOGY FEATURES & SPECIFICATIONS

This advanced hydrogel drug delivery system employs an aqueous two-phase system (ATPS) to facilitate concurrent polymer self-assembly and active pharmaceutical ingredient (API) separation.

- Aqueous two-phase system: ATPS is a well-established method that selectively partitions molecules by mixing specific polymer pairs with target compounds in water, thereby creating two distinct phases.
- Separation of polymers and API: By carefully selecting the appropriate polymer pair, both the self-assembling polymers and APIs are maintained within the same phase, ensuring a higher localized concentration.
- Simultaneous self-assembly and encapsulation: This elevated concentration triggers the polymers to undergo self-assembly, effectively encapsulating the API without the need for additional chemical modifications or cross-linkers.

Notably, the platform's versatility lies in its independence from specific chemical interactions, enabling the encapsulation of a broad spectrum of APIs, including peptides, proteins, and small-molecule drugs.

POTENTIAL APPLICATIONS

This IP meets the growing demand for safer, multifunctional eczema therapies. Key buyers include:

- Pharmaceutical companies seeking next-generation topical formulations to replace steroids or biologics (high cost, invasive administration).
- Dermatology-focused biotech firms interested in HA-based drug delivery platforms for inflammatory skin diseases.

Consumer health brands aiming to develop over-the-counter skincare products with clinical efficacy.

MARKET TRENDS & OPPORTUNITIES

Innovative drug delivery platform addresses a critical unmet need in chronic skin conditions that affect over 355 million people worldwide. Traditional treatments have limited success—only about 30% remission—and come with high costs (£6,000–£14,000 per patient annually), while existing delivery systems offer a modest 5–15% drug bioavailability. The self-assembling porous hydrogel technology achieves three major breakthroughs: an impressive 85% bioavailability through superior drug penetration, a

72-hour sustained release profile, and the capability to deliver multiple therapeutic agents in a single formulation.

The global dermatology therapeutics market, particularly for psoriasis and atopic dermatitis, is projected to reach $47 billion by 2027, growing at an 8.2% CAGR. This creates significant opportunities within key segments, such as the 125 million psoriasis patients seeking alternatives to biologics and the 230 million moderate-to-severe atopic dermatitis patients. This proprietary hyaluronic acid-based platform, with its optimized network structure, ensures unmatched drug penetration efficiency and controlled, prolonged release. This dual-action approach, which simultaneously targets inflammation, oxidative stress, and impaired barrier function, positions this technology as a disruptive alternative to current market leaders like biological therapies (45% market share) and topical corticosteroids (30%).

UNIQUE VALUE PROPOSITION

This technology represents a paradigm shift in eczema and psorosis treatment by integrating multi-pathway targeting, sustained drug delivery, and biomimetic repair into a single hydrogel platform, overcoming critical limitations of current therapies. By delivering multiple therapeutic agents concurrently, this particular platform effectively addresses the multifaceted nature of conditions such as psoriasis and atopic dermatitis, which involve intertwined pathways like inflammation, oxidative stress, proteasome dysfunction, and barrier impairment.

Key innovations include:

- **Multi-modal Targeting:** Simultaneously addressing multiple disease mechanisms reduces the risk of treatment resistance and incomplete responses typical of single-pathway approaches.

- **Self-Assembling Porous Structure:** An innovative, patent-protected two-phase system forms a stable network with uniform, adjustable pore sizes (10 nm to 4 µm).

- **Enhanced Penetration and Stability:** The platform's interconnected porous architecture creates a continuous gradient that maximizes API absorption while preserving drug stability under controlled conditions, ensuring sustained release (vs. short-acting creams) and reducing application frequency.

- **Risk Mitigation:** Utilizing compounds with proven safety profiles streamlines regulatory approval by focusing innovation on the delivery system itself.

By unifying symptom relief, root-cause modulation, and patient-centric design, this hydrogel offers a first-in-class solution for long-term eczema management, positioning it as a safer, more effective alternative to fragmented or invasive state-of-the-art options.