TECH OFFER

Sterilised Xanthones Nanoemulgels For Wound Healing

KEY INFORMATION

TECHNOLOGY CATEGORY:
Healthcare - Medical Devices
Healthcare - Pharmaceuticals & Therapeutics
Personal Care - Cosmetics & Hair

TECHNOLOGY READINESS LEVEL (TRL): TRL5
COUNTRY: THAILAND
ID NUMBER: TO175461

OVERVIEW

Wound healing is a complex process and is associated with multi-stage cell/tissue transformations. The entire wound healing process is generally complete around 20 days after skin injuries. Unfortunately, impaired wound healing, which usually occurs as a result of infection or the pathological status of the patients, i.e., diabetes, obesity, cancer, and in particular, severe inflammation, leads to excess exudate production and tissue ulcers, causing prolonged health problems and economic burdens for patients.

This technology introduces a sterilized nanoemulgels xanthones (XTs-NE-Gs) which are compounds from mangosteen peel dispersed in a gel base. The methodology involves using a high pressure homogenization technique without the addition of organic solvents in the formulation to produce sterilized XTs-nanoemulsion (NE) concentrate. After blending sterilized XTs-NE concentrate and the sterilized gel, a sterilized XTs-NE-G was obtained.

The concentrate has proven effective enhancement activities on the proliferation and migration rates of skin cells. It also promoted re-epithelialization, collagen deposition and inflammation suppression in mice models. Xanthones has proven strong anti-oxidant, anti-inflammatory and anti-bacterial properties.

The nanoemulgel technology can overcome the typical problems from the addition of some solubilizers to enhance solubility of XTs in the products, in particular, alcohol that cause burn sensation on the open wounds. Importantly, the obtained product from this technology could be sterilized and thus safe for wound healing purpose.

The technology owner is seeking collaborations for clinical trials to obtain information for supporting product safety and efficacy and manufacturers for scale up.

TECHNOLOGY FEATURES & SPECIFICATIONS

The study developed and optimized xanthones-loaded nanoemulgels (XTs-NE-Gs) for wound healing applications, focusing on formulation, physicochemical properties, and sterilization. Xanthones, primarily α-mangostin and γ-mangostin, were incorporated into an oil-in-water nanoemulsion using caprylic/capric triglyceride, oleic acid, and surfactants (polysorbate 80, sorbitan oleate 80).

- Droplet sizes in the nanometer range of 113–123 nm with narrow distribution (PDI 0.20–0.37) and negative zeta potential (−7 to −8 mV), ensuring stability.
- Entrapment efficiency of 93–94%, loading capacity of around 1.2%.
- To improve viscosity and retention on wounds, gels with sodium alginate (Alg) and Pluronic F127 (F127) were added.
- Suitable viscosity of 2300 mPa·s while enhancing fibroblast proliferation and migration.
- Sterilization was achieved by 0.22 µm membrane filtration of nanoemulsion and autoclaving the gel, later combined aseptically.
- Stability studies showed no significant physicochemical changes over 90 days at 27 °C.

Transmission electron microscopy confirmed spherical oil droplets embedded in gel matrices. *In vitro* release studies revealed controlled, sustained drug release consistent with Higuchi's model, while *ex vivo* skin permeation indicated slower release from the gel compared to nanoemulsion.

The system offers a portable, safe, affordable wound care, with key technical features including adjustable viscosity, controlled drug release, sterility, compatibility, stability, and ability to stimulate fibroblast growth factors (bFGF, KGF/FGF-7), accelerating wound healing.

POTENTIAL APPLICATIONS

The sterilized xanthones-loaded nanoemulgel (XTs-NE-G) represents a versatile wound care innovation with broad clinical and consumer applications. Designed to enhance fibroblast proliferation, collagen deposition, and re-epithelialization, it offers significant potential in acute wound management including:

- Surgical incisions, traumatic injuries, and burn care.
- Chronic and hard-to-heal wounds, such as diabetic foot ulcers, venous leg ulcers, and pressure sores, where infection control and accelerated healing are critical.
- Outpatient and home healthcare, providing patients with an affordable, portable, and easy-to-use treatment option.
- Natural compound base and sterilized preparation aligns with growing demand for safe, clean-label therapeutic products.

- Commercial wound dressings, gels, sprays, or patches.

UNIQUE VALUE PROPOSITION

The technology's modular design—allowing viscosity adjustment and controlled release enables adaptation for cosmeceutical and dermatological applications, such as scar reduction creams, anti-aging formulations, or products targeting skin barrier repair.

Additionally, its nanoemulsion delivery platform may be extended to other lipophilic bioactives, making it valuable for broader pharmaceutical and nutraceutical industries. Due to its small droplets based on nanotechnology, it has promising activities for wound healing. It enhances wound healing rate via accelerating skin cells proliferation, reducing inflammation, absorbs secretions from wounds and inhibits the growth of bacteria. This technology reduces production costs by using agricultural and industrial waste materials.