Anti-inflammatory and anti-proliferative role Phytochemical drug-attenuated lipid nanoparticles derived hydrogel to ameliorate imiquimod induced psoriasis like skin lesion in mice model

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Abstract: Psoriasis is a recurring T-cell-mediated immune skin disorder characterized by epidermal acanthosis, over-proliferation of keratinocytes, alteration of epidermal differentiation, and dermal angiogenesis. During psoriasis, treatment patients need to be treated with various corticosteroids frequently, which are not very effective and cause many side effects. Here, we have reported safe phytochemical drugs, i.e., phytochemical drug loaded lipid (EUNPL) nanoparticles which offered several advantages like better drug loading, controlled release, long term stability. EUNPL also enhanced cellular uptake via different pathways like a caveolae-mediated pathway, clathrin-mediated pathway, and microtubule formation, along with inhibiting over proliferating keratinocyte cells. The prepared phytochemical-based nanoparticles were spherical in size, i.e. 205.6±2 having an encapsulation efficiency of 85.7±2.3.Ex-*vivo* studies showed that the EUNPL can better lodge the drug inside the dermis and very minimal quantity reaching the systemic circulation. The EUNPL were further formulated into topical hydrogel using Carbopol 974P (EUNPgel), which showed a controlled release for 72 hours with no burst release. Further therapeutic efficacy of EUNPgel was analyzed on imiquimod induced psoriatic swiss albino mice model, which showed reduced psoriasis area severity index from 3.75 to 0.5 on day five as compared which was similar to that of the negative control. Similarly, the spleen body weight area was analysed, and the weight of the spleen of the treated group was 95.7 mg from 308.85. Collectively, these findings highlight the potential of eugenol as novel nanomedicine for treating psoriatic inflammation via enhanced cellular uptake, better skin penetration and retention and suggest that their use could be further expanded to treat other immune-related disorders like acne and atopic dermatitis.

Some Recent Publication

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3. Punjabi K., Eshant Bhatia, **Roshan Keshari**, K. Jadhav, Subhasini Singh, J. Shastri, and R. Banerjee. "Biopolymer Coating Imparts Sustainable Self-Disinfecting and Antimicrobial

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4. **Roshan Keshari**, Rajkumar Govindan, Biji Balakrishnan, P.A. Hassan." In situ gelling tissue adhesive hydrogels for wound closure and tissue regeneration". Engineered Biomaterials- Progresses and Prospects. First edition, Biji Balakrishnan, P. A. Hassan, A. K. Tyagi, worlds scientific publisher, 2022 (in press).

5. ***Keshari Roshan**, Amarjitsing Rajput, Aditi Nandi, Riyaz Ali M. Osmani, Nadim Ahamad, and Rinti Banerjee*. "Pectin- Based Vehicles for Delivery of Therapeutics." Royal Society of Chemistry, October 14, 2022.*

6. Dewani Mahima*, Nadim Ahamad, **Roshan Keshari**, and Rinti Banerjee. "Multifunctional Theranostic Nanomedicine for Photoacoustic Imaging-Guided Combination Tumor Treatment." Multifunctional Theranostic Nanomedicines in Cancer. Academic Press, 2021. https://www.sciencedirect.com/science/article/pii/B9780128217122000050.

7. Rajput, Amarjitsing, **Roshan Keshari**, Runali Patil, and R. Banerjee*. "Nanobiomaterials for Wound Healing" Nanotechnology in Medicine and Biology, 2021. First Edition, Huinan Liu, Tolou Shokuhfar & Sougata Ghosh, Elsevier, First Edition, 2021, 109-139

8. **R. Keshari**, A. Rajput, R. Patil, G. Sharma, R. Banerjee*. "Lipid-based drug delivery systems for psoriasis". Engineered Biomaterials- Progresses and Prospects. First edition, Biji Balakrishnan, P. A. Hassan, A. K. Tyagi, worlds scientific publisher,2021 (in press)

Short Biography



At present, Roshan keshari is working as Ph.D. Scholar at NanoBios lab, Department of Biosciences and Bioengineering, Indian Institute of Technology, Bombay, India. Currently, he is developing phytochemical based nanomedicine for transdermal drug delivery for localized and systemic treatment of psoriasis. Roshan's main focus is to design safe, low-cost, biomaterials assisted nanomedicine for better healthcare. His research interest include drug delivery, biomaterials , Nanomedicine and Nano nutraceuticals. During the Covid period Roshan has developed number of Protective gears to safeguard from covid like anti-bacterial, anti-viral, hydrophobic coated mask which are widely available in Indian market, Biodegradable alcohol free sanitiser, apparel spray, floor cleaner, Nano nutraceutical for mild to moderate covid patients.