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Nano-Repurposing Strategies for Enhanced Efficacy against New Indications

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Drug repurposing may be defined as developing old drugs for new indications. These old drugs may include already commercialized products, and drugs in clinical development. Drug repurposing approach is very cost-effective in putting new drugs in market, especially for rare diseases. While promising, drug repurposing has several limitations while being developed for new indications, including different dose requirements, acute vs chronic treatment needs, limited safety by new administration route, and patentability pertaining to possible commercialization. Encapsulating repurposed drugs in site-specific nanocarriers may provide an alternative to overcome these limitations. Nano-encapsulation i.e., nano-repurposing will be able to avoid off-target localization, reduce dose exposure to the body; and will also provide a patentable IP based on novel delivery methods. Our research group at St. John's University works in the domain of nano-repurposing for developing novel therapeutics for respiratory disorders, in a cost-effective fashion, that will also be scalable for commercial production. We aim to develop non-invasive ways of delivering therapeutics to the lungs by inhalation. In this presentation, I will present some of the recent works from our group, detailing about repurposing currently FDA-approved drugs for newer indications including lung cancer, mesothelioma, and breast cancer. I will also show some data about scale-up potential of formulation development approaches, employed by our group.

Recent Publications

1. Parvathaneni V, Shukla SK, Kulkarni NS, Gupta V* (2021). Development and Characterization of Inhalable Transferrin Functionalized Amodiaquine Nanoparticles – Efficacy in Non-small Cell Lung Cancer (NSCLC) Treatment. International Journal of Pharmaceutics.
2. Parvathaneni V, Elbatanony R, Goyal M, Chavan T, Vega N, Kolluru S, Muth A, Gupta V*, Kunda NK* (2021). Repurposing Bedaquiline for Effective Non-small Cell Lung Cancer (NSCLC) Therapy as Inhalable Cyclodextrin-based Molecular Inclusion Complexes. International Journal of Molecular Sciences
3. Wang X, Parvathaneni V, Shukla SK, Kulkarni NS, Muth A, Kunda NK, Gupta V* (2020). Inhalable Resveratrol-Cyclodextrin Complex Loaded Biodegradable Nanoparticles for Enhanced Efficacy against Non-Small Cell Lung Cancer. International Journal of Biological Macromolecules 164:638-650.
4. Parvathaneni V, Goyal M, Kulkarni NS, Shukla SK, Gupta V* (2020). Nanotechnology Based Repositioning of an Anti-Viral Drug for Non-Small Cell Lung Cancer (NSCLC). Pharmaceutical Research 37(7):123.

5. Shukla SK, Chan A, Parvathaneni V, Gupta V* (2020). Metformin-loaded Chitosomes for Treatment of Malignant Pleural Mesothelioma – A Rare Thoracic Cancer. International Journal of Biological Macromolecules 160:128-141.
6. Parvathaneni V, Kulkarni NS, Chauhan G, Shukla SK, Elbatanony R, Patel BI, Kunda NK, Muth A, Gupta V* (2020). Development of Pharmaceutically Scalable Inhaled Anti-cancer Nanotherapy – Repurposing Amodiaquine for Non-Small Cell Lung Cancer (NSCLC). Materials Science and Engineering C 115:111139.

Biography

Dr Vivek Gupta is an associate professor at St. John's University. He is an experienced pharmaceutical researcher with interests in developing novel therapies for respiratory disorders. His expertise lies in the fields of novel drug discovery and repurposing, and non-invasive delivery of small and macromolecules via oral and inhalation routes. He also has significant research interest in the fields of pharmaceutical scalability, and nano-repurposing. Diseases of interest include lung cancer, pulmonary fibrosis, pulmonary hypertension, and mesothelioma. Dr. Gupta's group has published >75 high-impact publications in peer reviewed journals like Journal of Controlled Release, Materials Science & Engineering C, Drug Discovery Today, to name a few. Dr. Gupta also serves on editorial boards of many peer-reviewed journals. Multiple technologies and therapies developed by Dr. Gupta's group have been patented and are at various stages of preclinical/clinical development.

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