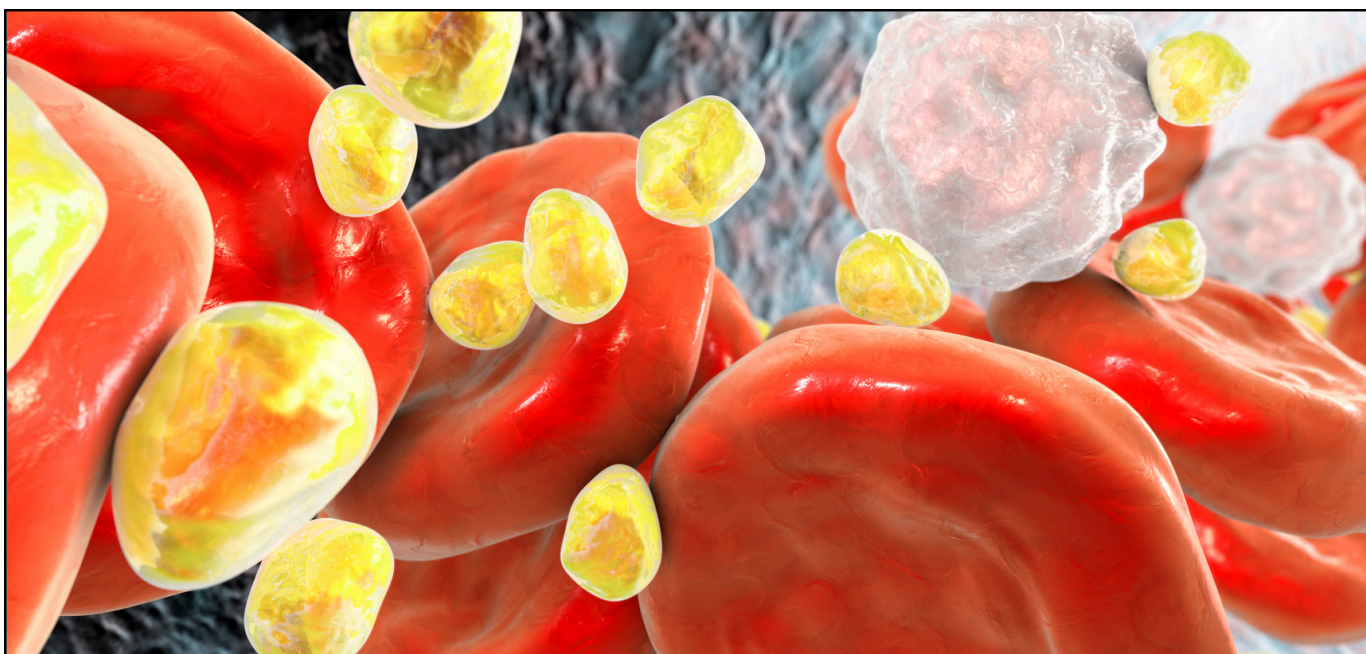


Innovative Strides

Developing Lipid Nanocarriers for Enhanced Lung Carcinoma Treatment

Lung carcinoma in its recognized state as a global health challenge demands innovative approaches due to issues associated with traditional treatments like chemotherapy, surgery and radiation. This study proposes a novel avenue in the form of local pulmonary inhalation delivery of anti-cancer agents using a DPI formulation.

The focus is on improving the pharmacokinetic profile of Gefitinib, an EGFR inhibitor, by encapsulating it within lipid nanocarriers. This method aims to enhance drug penetration into deep tumour tissues and achieve targeted delivery via the local pulmonary route, potentially revolutionizing lung cancer therapy.



Unlocking the Potential of Nano-Lipidic Carriers

Nanocarriers, spherical structures formed in a liquid environment, holds promise for delivering water insoluble drugs. Among them, Nano-Lipidic carriers (NLCs) emerges as a potential alternative. PEGylation, the attachment of PEG molecules to NLCs is introduced to prevent opsonization by lung macrophages, enabling controlled drug release over 24 hours. This sustained release mechanism addresses the limitations associated with inhalation drug delivery.



Repurposing Drugs for Enhanced Delivery

The study embarks on drug repurposing by designing a formulation for enhanced delivery and pharmacological actions. It involves preliminary screening of excipients, selection of lipid materials and other reagents. Analytical characterization, pre-formulation studies and PEGylation of nanocarriers aim to improve drug availability and retention.

Optimization through a statistical approach, characterization and evaluation of aerosolization behaviour culminate in providing a proof of concept through in vitro studies.

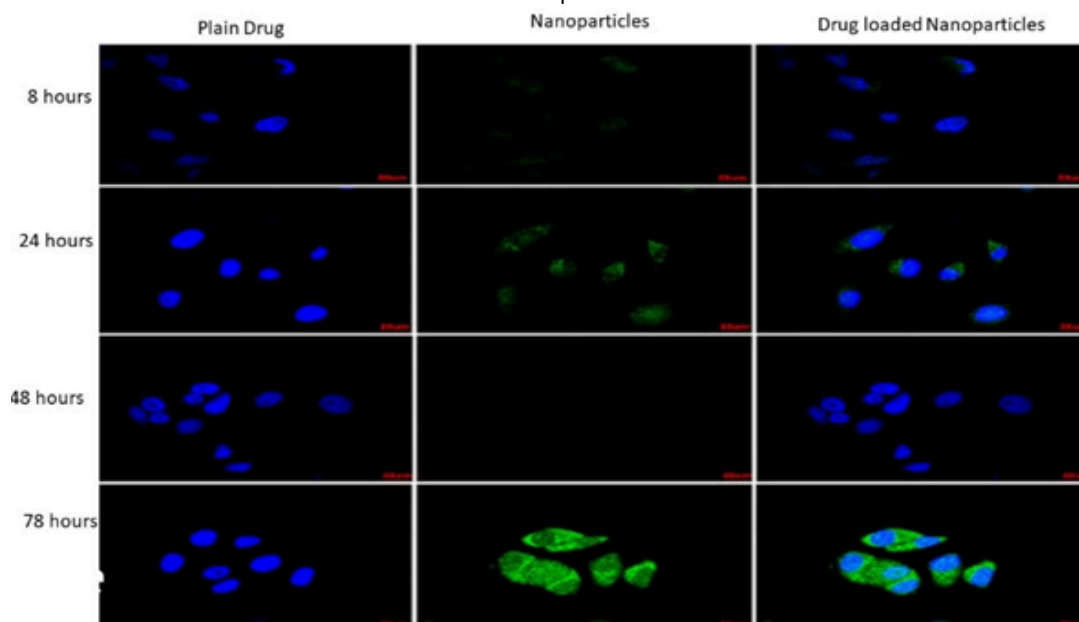


Image 1: (a) Confocal image of lung carcinoma cells

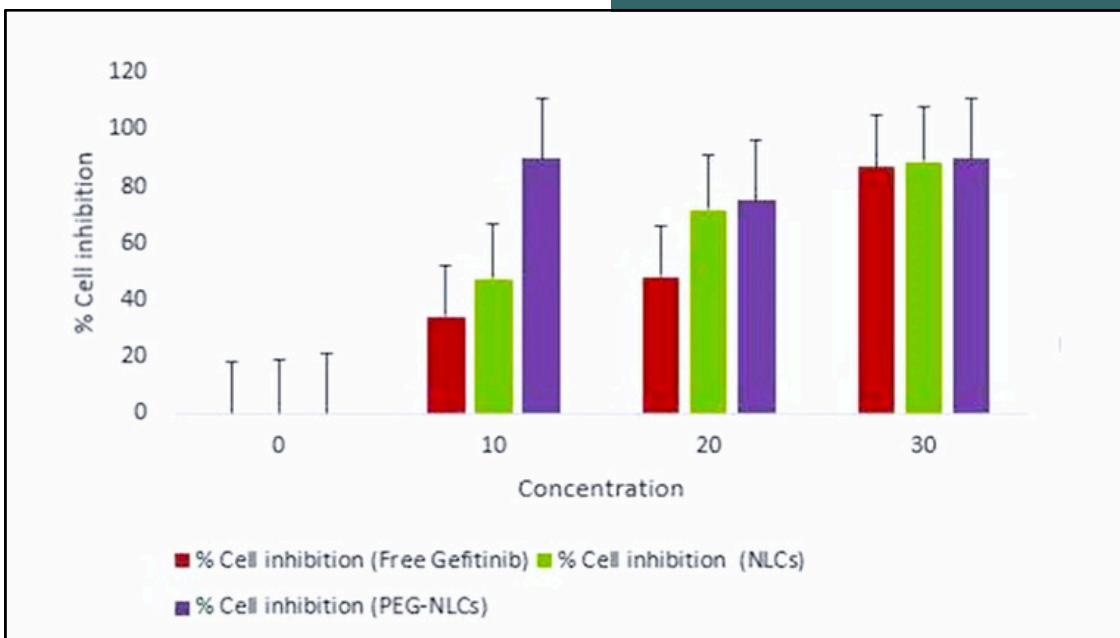


Image 1 (b) The graph of MTT assay (anticancer assay) treated with plain drug, nanoparticles and drug loaded nanoparticles

Crafting Gefitinib-Loaded Lipid Nanocarriers

Gefitinib-loaded lipid nanocarriers (Gef-NLCs) were prepared using a hot homogenization and ultrasonication method. The process involved heating the drug lipid and aqueous phases separately, followed by their mixing and subsequent ultrasonication. The resulting nanoparticles were then freeze dried for easy handling.

Promising Advances in Lung Cancer Treatment

Optimization via Box Behnken design yielded Gef-NLCs with a particle size in the nano-range (100-300 nm), zeta potential between -25 mv to +25 mv and an entrapment efficiency of 50-98%. In vitro drug release studies indicated sustained release behavior with PEG-NLCs exhibiting higher drug release and cell inhibition (>90%) compared to free Gefitinib after 48 hours of incubation.

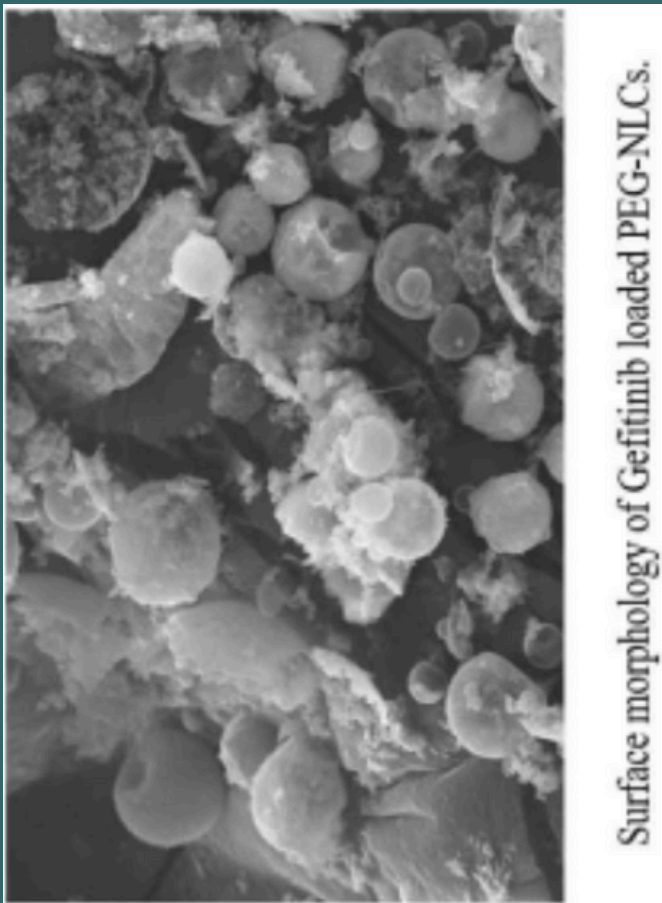
In-vitro lung deposition studies showed promising results with a high percentage emission and suitable aerodynamic characteristics.



Significance of Formulation

The research's focus on the formulation, optimization, and evaluation of PEGylated nanocarriers for Gefitinib showcases significant achievements. The optimized composition ensures uniform particle size distribution and suitable surface charge for stability.

The release kinetics indicate Matrix diffusion-based release type kinetics, and PEGylation enhances drug release and cell inhibition. Stability studies support the formulation's stability and suitability for lung disposition.





Article By
Dr. Asha Patel
Parul University

A Promising Step Forward in Lung Carcinoma Treatment

The developed Dry Powder Inhaler (DPI) formulation, comprising Gefitinib-loaded nano-lipid carriers, demonstrates stability after stability studies. Moreover, it proves to be suitable for lung disposition and cytotoxic, showing promise in reducing proliferating cancerous cells.

This innovative approach aims to improve anti-cancer therapy by enhancing prolongation and bioavailability at the tumor site, marking a significant step forward in lung carcinoma treatment

Patent Certificate

 INTELLECTUAL PROPERTY INDIA <small>PATENTS DESIGNS TRADE MARKS GEOGRAPHICAL INDICATIONS</small>		 भारत सरकार GOVERNMENT OF INDIA पेटेंट कार्यालय THE PATENT OFFICE पेटेंट प्रमाणपत्र PATENT CERTIFICATE <small>(Form 24 of The Patents Act, 1970)</small>	क्रमांक : 022120156 SL. No : 
पेटेंट नं. / Patent No.	408263		
अवेरल नं. / Application No.	202121002164		
पेटेंट करने की तारीख / Date of Filing	18/01/2021		
पेटेंटी / Patentee	Parul University		
अविष्कारक (यां लागू हो) / Inventor(s)	1.Devanshu J. Patel 2.Abhay Dharamsi 3.Dr. Asha Patel 4.Akshat Shah		
<p>प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में पेशकरीत NOVEL NANOCARRIER PRODUCT COMPOSITIONS OF GEFITINIB FOR THE TREATMENT OF LUNG CARCINOMA नामक आविष्कार के लिए, पेटेंट अर्जित करने, 1970 के अधिनियम के अनुसार जमा तारीख जनवरी 2021 के अठारहवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अर्जित किया गया है।</p> <p>It is hereby certified that a patent has been granted to the patentee for an invention entitled NOVEL NANOCARRIER PRODUCT COMPOSITIONS OF GEFITINIB FOR THE TREATMENT OF LUNG CARCINOMA as disclosed in the above mentioned application for the term of 20 years from the 18th day of January 2021 in accordance with the provisions of the Patents Act, 1970.</p>			
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अवधि की तारीख / Date of Grant	30/09/2022		
 Controller of Patents			
<p>ध्यान दें - इस पेटेंट के अंतर्गत प्रदान की गई सुरक्षा, यदि इसे नवीकरित नहीं किया जाता, तो 2023 के अठारहवें दिन को अंत में समाप्त होगा और 4 जून को होगा। Note - The term for renewal of this patent, if it is to be maintained will fall / has fallen due on 18th day of January 2023 and on the same day in every year thereafter.</p>			

Title: Novel Nanocarrier Product Compositions of GEFITINIB For The Treatment Of Lung Carcinoma

Team Members: Dr. Devanshu J. Patel, Dr. Asha Patel, Prof. Abhay Dharamsi, Prof. Akshat Shah

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