Unlocking a Visionary Solution

Innovative Biodegradable ophthalmic compositions of Cyclosporin A for the treatment of Dry Eye

The prevalence of Dry Eye Syndrome varies depending on the diagnostic criteria employed and has ranged from approximately 5 to 50% in population-based studies, which has been shown to be as high as 70 % in visual terminal users. A ground-breaking study has emerged seeking to revolutionize the treatment of dry eye syndrome through innovative means. This research takes a step into the development of pioneering polycaprolactone (PCL) hyaluronic acid (HA) laden biodegradable nanoparticles containing cyclosporine-A (CsA) for sustained release.

Such an approach not only stands as a departure from traditional methods but promises to address the limitations associated with frequent eye drop usage.
Dry eye syndrome is a prevalent condition that arises when the tears fail to sufficiently lubricate the eyes. There are various factors that can cause tears to be insufficient and unsteady. Insufficient tear production or the production of low-quality tears can lead to the occurrence of dry eyes. The occurrence of tear instability results in inflammation and harm to the surface of the eye.

Tradition vs. Innovation: Navigating the Need for Change

Traditional management of dry eye syndrome often involves the repetitive use of eye drops.

While this method offers symptomatic relief, its downsides, including potential toxicity and damage to ocular tissues have spurred a quest

for a more effective and patient friendly alternative. This is where the exploration of biodegradable nanoparticles takes centre stage. The key to this study lies in the utilization of polycaprolactone and PLGA (50:50 poly lactic acid, poly glycolic acid). Recognized by the FDA for their biocompatibility and biodegradability, these materials offer a unique avenue for sustained drug release particularly beneficial for lipophilic drugs.

> *“We objectivized a targeted approach to Dry Eye Syndrome”*

*A*ffirms Dr. Asha Patel.

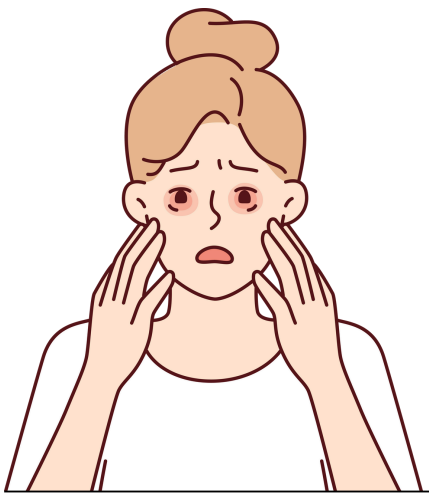
Adding, “aim of research is crystal clear, to develop, optimize and evaluate a sustained release PCL-HA laden biodegradable implant fiber containing Cyclosporine-A, strategically tailored for the treatment of dry eye syndrome.”

Methodology: The art of Precision in Development

The study's methodology involves the meticulous preparation of nanoparticles using the oil in water solvent emulsification technique. The subsequent development and optimization of biodegradable implant fibres take into account various product variables. Notably, the formulation achieved an impressive 72.3% drug release over 72 hours positioning it as a robust contender for sustained release formulations. Sterilization, a critical aspect of ocular drug delivery was achieved through the autoclave method, ensuring the safety and efficacy of the final product.

Small Particles, Big Impact

Results showcase a formulation with 1.18% polycaprolactone and 0.16% hyaluronic acid, boasting a particle size of 248.2 nm, a zeta potential of -0.248 ± 0.137 mV and an entrapment efficiency of 40.945 ± 1.561%. This formulation not only demonstrated efficient control of in-vitro drug release (92.59 ± 0.05% Cyclosporine-A release at 24 hours) but also proved safe and non-irritant in ocular irritancy studies.



The Scientific Significance

The study's discussion provides crucial insights into the implications of its findings. The biodegradable implant fibers enhance precorneal retention time, facilitating sustained drug release over 72 hours. As shown in image 1, surface morphology revealed that nanoparticles and nanofiber were spherical and fibrous in shape respectively. The nanoparticles, with their distinctive characteristics, enhance drug solubility and penetration, contributing to increased bioavailability.

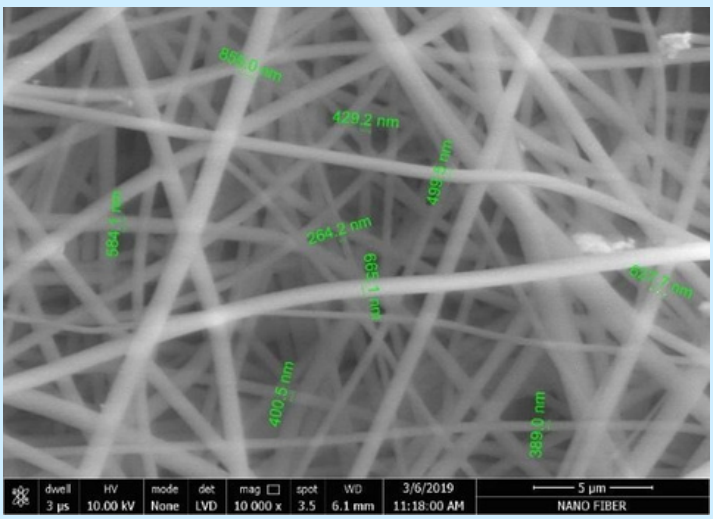


Image.1 :- Surface analysis and particle size distribution analysis of biodegradable implant fibers using scanning electron microscopy

A Study Beyond Papers

Emphasizing the innovative nature of the developed formulation, Dr. Asha Patel's study showcases its potential to provide sustained relief from dry eye syndrome. The use of biodegradable polymers eliminates the need for surgical removal post-therapy, enhancing patient acceptance and compliance. This visionary solution not only addresses a pressing medical need but also opens doors to a new era of ocular drug delivery.

“Eyes are Priceless, Take Care of Them.”

With sustained relief and enhanced biodegradability, this patient-friendly approach could extend its applications across various ophthalmic treatments, marking a paradigm shift in how we approach ocular health. Dr. Asha Patel's scientific journey is not just a study, it's a leap into the future of ocular care “one nanoparticle at a time.”

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The Patent Office, Government Of India
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आविष्कारकों का नाम /Name of Inventor(s) : 1.Dr Rakesh Patel 2.Dr. Asha Patel 3.Ishrat Chhowala 4.Dr. Devanshu Patel 5.Prof. Abhay Dharamsi

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाभवर्णित *NOVEL OPHTHALMIC COMPOSITIONS OF CYCLOSPORIN A FOR THE TREATMENT OF DRY EYE SYNDROME* नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख मई 2020 के अठारहवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled *NOVEL OPHTHALMIC COMPOSITIONS OF CYCLOSPORIN A FOR THE TREATMENT OF DRY EYE SYNDROME* as disclosed in the above mentioned application for the term of 20 years from the 18th day of May 2020 in accordance with the provisions of the Patents Act,1970.

अनुदान की तारीख : 11/10/2023
Date of Grant : 11/10/2023

Controller of Patents

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, मई 2022 के अठारहवें दिन को और उसके पश्चात प्रत्येक वर्ष के उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 18th day of May 2022 and on the same day in every year thereafter.

Patent: Title: NOVEL OPHTHALMIC COMPOSITIONS OF CYCLOSPORIN A FOR THE TREATMENT OF DRY EYE SYNDROME

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