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PD-CS Nanoparticulate IA Injection: Treatment of Arthritis

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An autoimmune condition called Rheumatoid Arthritis (RA) is typically diagnosed in older people and women. A woman has a 3.6% lifetime risk of developing RA, compared to a man's 1.7% lifetime risk. On the other hand, RA can strike anyone, even very young children. Among the available treatments for arthritis include NSAIDs (nonsteroidal anti-inflammatory medicines), steroids, disease-modifying anti-rheumatic therapies, and biological response modifiers. Prednisolone (PD), a glucocorticoid, is a key treatment for rheumatoid arthritis because it prevents the generation of pro-inflammatory cytokines. It is primarily used to treat autoimmune hepatitis, rheumatoid arthritis, and multiple sclerosis. The primary goal of this work is to create a different intraarticular injectable delivery method that contains PD nanoparticles for the effective treatment of arthritis in the animal model.

The study was carried out at the Department of Traditional Chinese Medicine, The Fourth Hospital of Baotou, Baotou City, and Inner Mongolia. Chitosan (Deacetylation degree of 70-85%) was purchased from Weifang Yuexiang Chemical Co. Ltd. in China, and PD was received as a gift sample from Zhejiang Hisun Pharmaceutical Company in Taizhou City, China.

Sigma Aldrich China provided the following products: tripolyphosphate (TPP), tween 80, acetic acid, and trehalose. Using TPP as a counterion, ionotropic external gelation was used to create PD-loaded CS nanoparticles. The 10 mg of PD nanoparticles were suspended in water and injected after which the water was subjected to ultrasonication for 15-20 min. Scanning electron microscopy was used to examine the surface properties of the created nanoparticles. 30 New Zealand white males and females, weighing between 2.1 and 2.9 kg, were separated into 3 groups, each with 10 rabbits. After 24 hrs of carrageenan administration, the initial amount of oedema was calculated using the micrometre.

The ionotropic external gelation process was used to create PD-loaded chitosan nanoparticles, which displayed the following physicochemical properties. In all batches, the production yield of the nanoparticles was higher than 90%, indicating little loss of excipients and other nanoparticle constituents. The greater drug loading and EE values also showed that the nanoparticles were acceptable. The dried nanoparticles were found to be spherical, smooth, and free-flowing according to the surface morphological investigation. All batches of nanoparticles displayed good, sustained-release behaviour lasting between 12 and 32 hrs. In the carrageenan-induced arthritis model, the antiarthritic activity of PD-CS nanoparticle intramuscular injection was assessed. The goal of the ongoing study is to effectively treat arthritis in an animal model by developing PD-loaded chitosan nanoparticles and

injecting them intramuscularly.

In contrast to the traditional medication delivery mechanism for the treatment of arthritis, the currently being developed prednisolone-loaded nanoparticulate injection would be a potential alternative strategy. With this newly discovered technology, the fundamental drawback of the conventional system could be overcome. The typical gelling systems in the form of injections are easily removed from the joints and require the administration of the dose repeatedly. To establish the safety and effectiveness of the formulation, other clinical applications must be researched.

JOURNAL REFERENCE

Yue, S. and L. Bo, 2022. Formulation and development of prednisolone loaded nanoparticulate injection for the treatment of arthritis. Int. J. Pharmacol., 18: 611-617

KEYWORDS

Arthritis, prednisolone, nanoparticles, carrageenan, oedema, inflammation, arthralgia