

## ***In vivo* evaluation of novel nanoparticles containing dexamethasone for ocular drug delivery on rabbit eye**

**S. Kasayi<sup>1,\*</sup>, F. Rafie<sup>2</sup>, Y. Javadzadeh<sup>3</sup>, A. Javadzadeh<sup>4</sup>, L. Alizadeh Ghavidel<sup>4</sup>, B. Jafari<sup>2</sup>, M. Moogooee<sup>4</sup>, S. Davaran<sup>5</sup>**

<sup>1</sup>*Student research committee, Tabriz university of medical science, faculty of pharmacy*

<sup>2</sup>*Drug Applied Research Center, Tabriz University of Medical Science, Tabriz, Iran*

<sup>3</sup>*Faculty of Pharmacy, Tabriz University of Medical Science, Tabriz, Iran*

<sup>4</sup>*Faculty of Medicine, Department of Ophthalmology, Tabriz University of Medical Science, Tabriz, Iran*

<sup>5</sup>*Research Center for Pharmaceutical Nanotechnology, Tabriz University of Medical Science, Tabriz, Iran*

**Background and Aims:** The purpose of this study was to investigate the *in vivo* effects of a new smart polymer loaded with dexamethasone on an inflamed rabbit eye.

**Methods:** Polymeric micelles were prepared using N-isopropylacrylamid (NIPAAM), vinyl pyrrolidone (VP), and methacrylate (MAA) as monomers in the presence of N,N-methylene bis-acrylamid (MBA) and triethyleneglycol dimethacrylate (TEGDMA) as cross-linking agents. These micelles were characterized on their physicochemical properties using a particle size analyzer, FT-IR, and <sup>1</sup>H NMR. Dexamethasone-containing nanosuspensions consisting of these temperature- and pH-sensitive micellar nanoparticles were prepared. To evaluate the efficacy of novel ocular drug delivery using these novel micellar nanoparticles, uveitis was induced by intravitreal injection of the endotoxin within the rabbit eyes. Clinical distinctions for the inflammation within eyes were performed using Hogan's classification method and statistically analyzed using independent student t-tests and Mann-Whitney U-tests.

**Results:** Cross-linked copolymer of NIPAAM-VP-MAA was prepared by free radical copolymerization of the monomers in the presence of NIPAAM and TEGDMA as cross-linking agents and ammonium per sulfate (APS) as the initiator in high yields. The PSA data represented that the particles have mean sizes between 300–450nm. Topical administration of prepared nanosuspensions clearly reduced uveitis symptoms, which were qualified with Hogan scoring. Statistical analysis represented that both of the nano formulations significantly reduced inflammation ( $p < 0.05$ ) during 48 hr after LPS injections.

**Conclusions:** Nanosuspension prepared with MBA showed rapid treatment in comparison with other nano formulations. The formulation also showed higher anti-inflammatory activity for a longer duration compared to aqueous suspension of the drug, which is due to small particle size and mucoadhesiveness of polymeric micelles.

**Keywords:** Dexamethasone; Nanoparticles; N-isopropylacrylamide; Ocular drug delivery