DEVELOPMENT OF CASIN-ENCAPSULATED PLGA-PEG NANOPARTICLES FOR COLORECTAL CANCER TREATMENT

Altyn Zhuraliyeva[1]. Bauyrzhan Umbayev[1], Sanazar Kadyr[1,2],Aislu Yermekova[1], Aigerim Makhambetova[1], Daulet Kaldybekov[3], Ellina Mun[4], Denis Bulanin[2] and Sholpan Askarova[1]

[1]Laboratory of Bioengineering and Regenerative Medicine, National Laboratory Astana, Nazarbayev University, Astana 010000, Kazakhstan
[2]School of Medicine, Nazarbayev University, Astana 010000, Kazakhstan
[3]Department of Chemistry and Chemical Technology, Al-Farabi Kazakh National University, Almaty 050040, Kazakhstan
[4]School of Sciences and Humanities, Nazarbayev University, Astana 010000, Kazakhstan

**Corresponding author (s): altyn.zhuraliyeva@nu.edu.kz*

Background: CASIN, a selective Cdc42 inhibitor, shows strong antitumor potential in colorectal cancer (CRC) but its clinical translation is limited by rapid clearance and low bioavailability. To overcome these challenges, we developed poly(-lactic-co-glycolic acid)-polyethylene glycol (PLGA-PEG-COOH) nanoparticles for efficient encapsulation and delivery of CASIN.

Materials and methods: CASIN-loaded PLGA-PEG-COOH nanoparticles were prepared via one-step nanoprecipitation. The resulting particles were characterized for morphology, size, zeta potential, drug loading, encapsulation efficiency, and stability. Blood compatibility was assessed by hemolysis assays, while *in vitro* antitumor activity was evaluated in CRC cell lines (HT-29, SW620, HCT116) using CCK-8 assays.

Results: The CASIN-PLGA-PEG nanoparticles were spherical and uniform, with an average size of 86 ± 1 nm. Encapsulation efficiency reached 66 ± 5% with a drug loading of 5 ± 1%. The formulation provided sustained drug release over 24 hours. Hemolysis assays demonstrated excellent biocompatibility (<1% hemolysis across tested doses). *In vitro* studies showed potent antiproliferative activity, with IC_{50} values of 19.55 μM (HT-29), 9.33 μM (SW620), and 10.45 μM (HCT116).

Conclusion: Encapsulation of CASIN into PLGA-PEG-COOH nanoparticles improved drug stability, release profile, and safety, while maintaining strong antitumor efficacy in vitro. This nanoplatform represents a promising strategy for targeted Cdc42 inhibition in CRC and warrants further investigation in in vivo models.

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Key words: Colorectal cancer, Cdc42 inhibition, PLGA-PEG nanoparticles, Drug delivery.