Migration and proliferation effects of Thymoquinone-loaded nanostructured lipid carrier (TQ-NLC) and Thymoquinone (TQ) on in vitro wound healing models

ABSTRACT

Wound healing is a regulated biological event that involves several processes including infiltrating leukocyte subtypes and resident cells. Impaired wound healing is one of the major problems in diabetic patients due to the abnormal physiological changes of tissues and cells in major processes. -ymoquinone, a bioactive compound found in Nigella sativa has been demonstrated to possess antidiabetic, anti-inflammatory, and antioxidant effects. Today, the rapidly progressing nanotechnology sets a new alternative carrier to enhance and favour the speed of healing process. In order to overcome its low bioavailability, TQ is loaded into a colloidal drug carrier known as a nanostructured lipid carrier (NLC). -is study aimed to determine the effect of TQ-NLC and TQ on cell proliferation and migration, mode of cell death, and the antioxidant levels in normal and diabetic cell models, 3T3 and 3T3-L1. Cytotoxicity of TQ-NLC and TQ was determined by MTT assay. -e IC10 values obtained for 3T3-L1 treated with TQ-NLC and TQ for 24 hours were 4.7 ± 3.3 and 5.3 ± 0.6 μM, respectively. As for 3T3, the IC10 values obtained for TQ-NLC and TQ at 24 hours were 4.3 ± 0.17 and 3.9 ± 2.05 μM, respectively. TQ-NLC was observed to increase the number of 3T3 and 3T3-L1 healthy cells (87–95%) and gradually decrease early apoptotic cells in time- and dose-dependant manner compared with TQ. In the proliferation and migration assay, 3T3-L1 treated with TQ-NLC showed higher proliferation and migration rate ($p < 0.05$) compared with TQ. TQ-NLC also acted as an antioxidant by reducing the ROS levels in both cells after injury at concentration as low as 3 μM. -us, this study demonstrated that TQ-NLC has better proliferation and migration as well as antioxidant effect compared with TQ especially on 3T3-L1 which confirms its ability as a good antidiabetic and antioxidant agent.