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Effects of methadone nanoparticles on cell proliferation and cell viability of MCF-7 cells

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Methadone is a synthetic opioid medication best known for its use in the treatment of opioid dependence. Methadone is also an effective analgesic agent, potentially with increased efficacy in the setting of neuropathic pain. Preclinical research has studied and established that many nanoparticle (NP) characteristics, such as size, shape, surface properties and drug loading, can affect therapeutic efficacy, biodistribution, pharmacokinetics and toxicity of NP-drug formulations. This study was performed to analyze the effect of methadone nanoparticles (MNP) on the proliferation and cell viability of MCF-7 cells. MCF-7 cells were cultured in DMEM culture medium. This culture was divided into two groups: (1) Culture that treated with methadone dose, (2) Culture that treated with MNP. There were six treatments including: control group (culture without any treatment, treatment i), cultures that treated with doses 20, 40, 80, 160 and 320 μg (treatments ii-iv) of methadone and MNP, respectively. The cells proliferation was assessed by MTT test and cell viability was assessed by LDH test. In group 1, methadone in treatments ii and iii was not toxic and increased the proliferation of cells compared with control treatment ($p<0.05$). Methadone in treatments iv to vi were toxic and decreased the cell viability and proliferation of cells compared with control treatment ($p<0.05$). In group 2, MNP in treatments ii to iv, were not toxic and increased the proliferation of cells compared with control treatment ($p<0.05$). MNP in treatments v and vi were toxic and decreased the cell viability and proliferation of cells compared with control treatment ($p<0.05$). In group 2, the cell viability and cell proliferation of MCF-7 cells in treatments ii to vi were increased compared with the same treatments of group 1, respectively ($p<0.05$). It can be concluded that the MNP at low concentration (20-80 μg) can increase MCF-7 cell proliferation, and was found nontoxic to cells).

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