



Comparative Effects of Curcumin Nano-Niosomes and Free Curcumin on Apoptosis, Intracellular ROS, and STAT3/NF- κ B Signaling Pathway in A549 Lung Cancer Cells

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Abstract

BACKGROUND: Niosomes are biodegradable and biocompatible carriers that have a hydrophilic head and a lipophilic tail and can encapsulate both hydrophobic and hydrophilic drugs. By nanotechnology and curcumin-loaded niosomes, it is possible to exploit the diverse anticancer properties of curcumin via targeted delivery to the desired tissue.

OBJECTIVES: The present study aims to evaluate the effects of curcumin-loaded niosome nanoparticles (CM-NP) and free curcumin (CM) on apoptosis, intracellular reactive oxygen species (ROS), and STAT3/NF- κ B signaling pathway in A549 lung cancer cell line.

METHODS: The A549 cells were first exposed to CM-NP and CM. Then, the apoptosis, intracellular ROS, and STAT3/NF- κ B signaling pathways were evaluated using commercial kits.

RESULTS: Exposure to CM-NP significantly increased the early and late apoptotic A549 cells compared to CM ($P < 0.001$). Based on the half-maximal inhibitory concentration values, the CM-NP caused a significant increase in ROS production compared to CM ($P < 0.001$). In addition, exposure to CM and CM-NP led to a significant decrease in the expression levels of STAT3 and NF- κ B compared to non-exposed cells ($P < 0.001$). The expression levels of NF- κ B and STAT3 in A549 cells exposed to CM-NP were significantly lower than those in the CM group ($P < 0.05$).

CONCLUSIONS: The curcumin nano-niosomes induces apoptosis in A549 lung cancer cells more than the free form of curcumin, in an oxidative stress-dependent manner and by increasing intracellular ROS and by STAT3/NF- κ B signaling pathways. These results demonstrate the potential of the curcumin nano-niosomes as a promising method for lung cancer treatment.

Keywords: Apoptosis, A549 Cell Line, Curcumin nano-niosomes, Lung cancer, Nanocarriers

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Figure Legends and Table Captions

Table 1. Summary of primers for gene expression.

Figure 1. Effects of CM-NP and CM on apoptosis in A549 cancer cells.

Figure 2. Effects of CM-NP and CM on intracellular ROS.

Figure 3. Effects of CM-NP and CM on the expression of STAT3 and NF- κ B.