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Antiproliferative Activity and Apoptotic Potential of Curcumin on Human Acute Myeloid Leukemia Cell Line (HL-60)

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Abstract

Curcuma Longa or also known as turmeric is a prominent natural remedy in Asia that has been utilized to heal diseases for decades. It has been demonstrated to have substantial biological activities, including anticarcinogenic, antimutagenic, antioxidant, anti-inflammatory, anti-infectious, hypocholesterolemic, and chemopreventive properties. Curcumin is a therapeutic substance extracted from Curcuma Longa that is thought to have anti-cancer properties against a variety of cancer types. However, its anti-cancer potential on acute myeloid leukemia (AML) remains uncertain [1,2].

The objective of this intervention study was to examine the anti-proliferative and apoptotic effects of curcumin on the HL-60 cell line of acute myeloid leukemia. A stock solution of pure curcumin compound was obtained by dissolving it in dimethyl sulfide (DMSO). HL-60 cells were treated with six different concentrations which were 100, 50, 25, 12.5, 6.25, 3.125 µg/ml and incubated at three distinct incubation period (24, 48 and 72 hours). The in vitro cell viability was determined using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay and quantified using a microplate reader at 570 nm. Acridine orange (AO) and propidium iodide (PI) staining were employed to evaluate morphological changes.

MTT assays results show that curcumin has a high cytotoxicity effect on HL-60 cells. The maximal half inhibitory concentration (IC_{50}) value of curcumin was consistently decreased when the incubation time increased. The IC_{50} of curcumin on HL-60 cells were reported to be 13, 8, and 3.5 µg/ml at 24, 48 and 72 hours of incubation, respectively. There was a significantly different IC_{50} value ($p<0.05$) of curcumin between the incubation periods (Figure 1). The morphological alteration was shown in AO/PI staining by the appearance of early apoptosis, late apoptosis, and necrotic cells.

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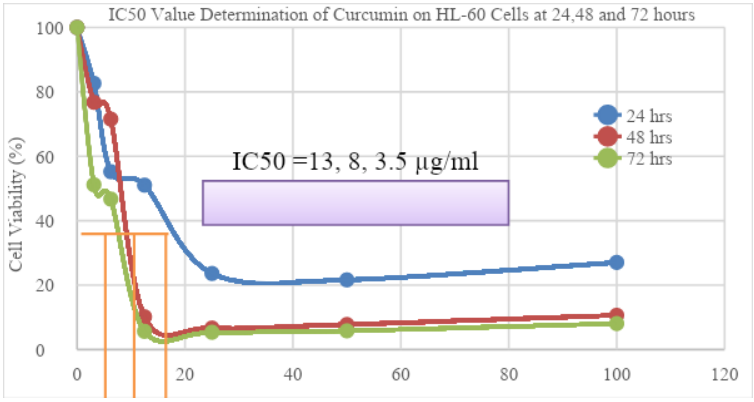

Figure 1: Graph of HL-60 cell viability against the concentration of curcumin. The IC_{50} value was determined at 24, 48, and 72 hrs with concentration of 13, 8, and 3.5 µg/ml.

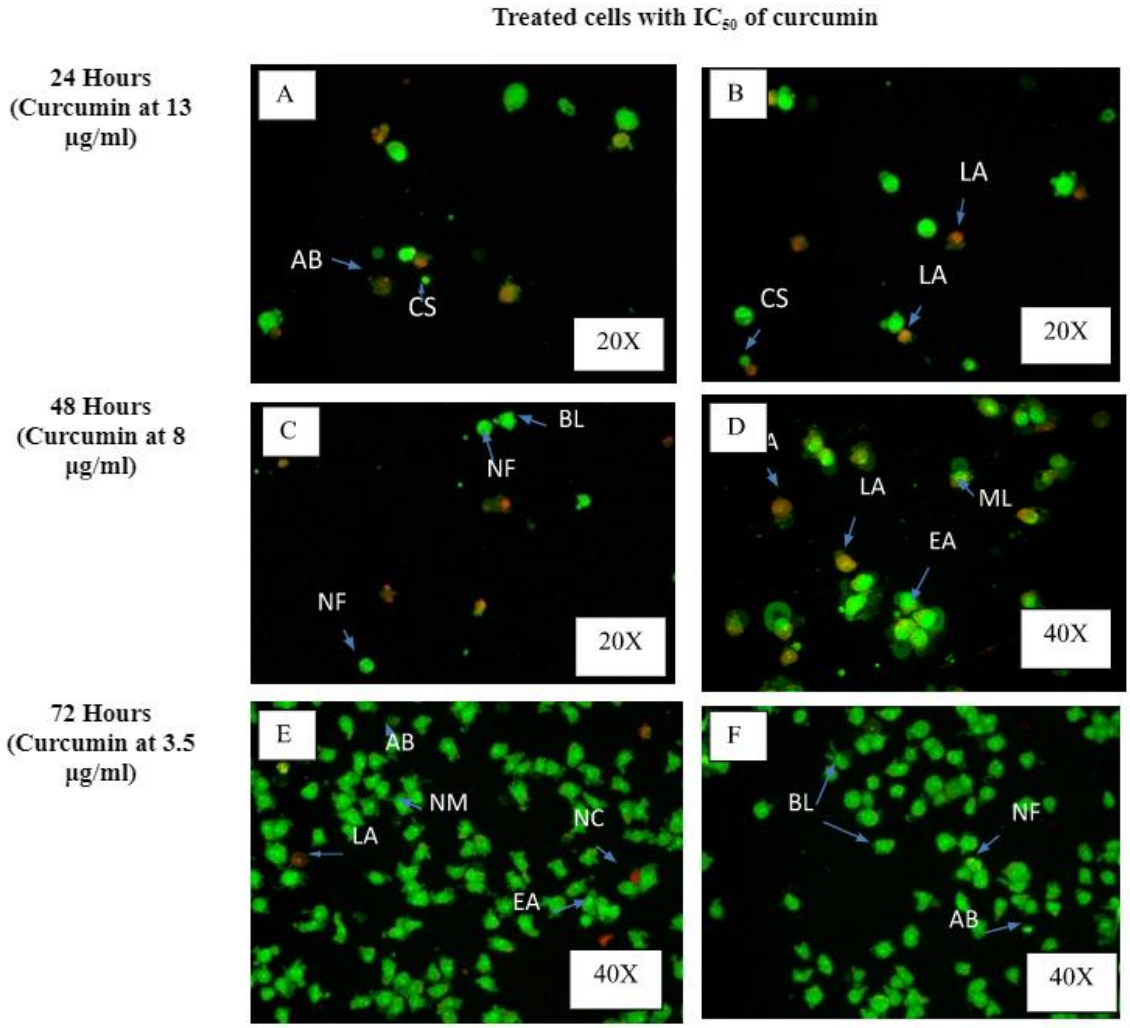

Figure 2: Early apoptosis (EA), late apoptosis (LA), cell blebbing (BL), membrane loose (ML), nuclear fragmentation (NF), apoptotic body (AB), necrotic cell (NC), nuclear margination (NM) and cell shrinkage (CS).

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These findings illustrated that curcumin revealed an effective anti-cancer action on human acute myeloid leukemia HL-60 cell line. Further research is required to determine the mechanism of cell death in HL-60 cells treated with pure curcumin compound.

In conclusion, the study revealed the role of putative targeted genes in the biological mechanism in gout pathogenesis has provides insight of the potential biomarkers in developing the personalized medicine better treatment for gout patient in ensuring better patient healthcare.

Keywords
Curcumin, Acute Myeloid Leukemia, HL-60 cells

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