Investigation of Potential Anti-Cancer Impacts of Coffee Bean-Derived Exosomes Through Anti-Proliferative and Apoptosis Inducing Effects on Melanoma Skin Cancer Cells via Mitogen-Activated Protein Kinase Signaling Pathway

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Epidemiological studies performed in large cohorts among different populations indicate a negative correlation between developing melanoma skin cancer and drinking coffee. While coffee's popularity continues to rise both as a beverage and a cosmetic ingredient, research on its cancer-protective effects has primarily focused on its consumption. To investigate possible anti-cancer effects of coffee on melanoma mechanistically, unroasted and roasted coffee bean-derived exosomes were used as delivery vehicles of coffee's biological and chemical constituents into SK-MEL-28 melanoma cells. Cell viability via cytotoxicity assay and apoptosis via nuclear staining and flow cytometry were performed to determine anti-cancer effects of coffee exosomes on SK-MEL-28 cells. Spheroid formation and wound healing assays were used to analyze anti-tumoral and anti-migratory effects of coffee exosomes on SK-MEL-28 cells. Cellular pathways affected by coffee exosome treatment of SK-MEL-28 cells were analyzed with transcriptomics and western blot analysis. The findings revealed that unroasted and roasted coffee exosomes induced apoptosis of melanoma cells distinctly. Furthermore, coffee exosomes decreased tumor growth and weakened the migratory ability of SK-MEL-28 cells. The molecular mechanism underlying the anti-cancer effects of coffee exosomes on SK-MEL-28 cells was found to be related to the suppression of the Mitogen-Activated Protein Kinase (MAPK) signaling pathway via suppression of the transcription of SERPINA1, an activator of the PI3K/Akt pathway that cross-talks with MAPK As the first study to investigate the effects of coffee exosomes on melanoma, this study revealed that coffee exosomes could be used as natural therapeutic alternatives for melanoma treatment

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