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Investigations on the cytotoxic effect of gold nanoparticles synthesized using Ferulic acid on human epidermoid carcinoma (A431) cells

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Nowadays, gold nanoparticles (AuNPs) are gaining wide attention in several areas including research and development and medical fields. Certain polyphenols have the property of converting the Au3+ solution into AuNPs at an appropriate pH and at the same time binding to them. One such polyphenol, ferulic acid, (fa) has been used to synthesize gold nanoparticles. It is found in coffee, rice, fruits (citrus fruits, banana, and orange juice) vegetables (eggplant, bamboo shoots, beetroot, cabbage, spinach and broccoli) and beverages. It has been used in the treatment of diabetes, cardiovascular diseases, neurodegenerative disorder, skin diseases, melanoma and non-melanoma skin cancers. In this study, stable gold nanoparticles (AuNPs) were formed by reacting fa with HAuCl4 at room temperature. Fa also acted as the stabilizing agent. Optimal formation of fa-AuNPs was obtained at pH 9.5 and MR at 1:4. The synthesized fa-AuNPs were characterized using UV- Visible spectroscopy, HR-TEM, DLS and FTIR analyses. The average size of fa-AuNPs measured by DLS was 34.2 ± 1.3 nm. fa-AuNPs were found to induce cytotoxicity to human epidermoid carcinoma cells (A431) in a concentration and time dependent manner. Further, the mode of cell death was via apoptosis, as evidenced through sub-G1 population. The loss of mitochondrial membrane potential (MMP) was observed with increase in ROS levels and caspase -3 activity. From these results, it was concluded that fa-AuNPs induced cell death of A431 cells via apoptosis through mitochondria dependent pathways. Hence, fa-AuNPs can be considered as a promising candidate for use in skin cancer treatment.

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