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A new ray of hope for anticancer drug development and treatment

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Nanotechnology has made significant contributions to the field of medicine. Recent advances in nanochemistry have enabled the use of nanocatalysts to activate catalytic reactions for therapeutic effects. Due to the high efficiency and selectivity of nanocatalysts, they are being explored as therapeutic agents for cancer treatment. Heterocyclic compounds have been widely used in pharmaceutical industries as they are essential structural components of anticancer agents. These compounds can be synthesised in an inexpensive and feasible manner using nanocatalysts. There are several advantages in using nanocatalysts, such as decreased production cost, short reaction time and uniformity of the synthesised molecules. Some of the nanocatalysts used are magnesium oxide, palladium and carbon nanotubes. One of the strategies being explored in cancer therapy is based on utilising Fenton reaction to directly treat the tumour cells. This refers to the high levels of hydrogen peroxide that exist in cancer cells which can be made to react with therapeutic molecules containing hydroxyl radicals (•OH) through Fenton reaction and effectively killing the cancer cells. Targeting of the tumour microenvironment can be achieved using magnetic nanocatalysts which activate Fenton reaction. The hydrogen peroxide molecules from the cancer cells can be activated to trigger the ferroptosis (cell death) using Fe²Ã¢Â•Âº as the magnetic nanocatalyst. However, the intracellular level of hydrogen peroxide is not high enough to facilitate the Fenton reaction in vivo, hence researchers have developed another approach to combine glucose oxidase with the nanocatalyst to increase the levels of hydrogen peroxide. This would help in increasing the efficacy and promote the stimulation of anticancer activity. Therefore, nanoparticles with distinct physicochemical properties can be used as effective catalysts for reactions to produce heterocyclic compounds as potential anticancer drugs as well as promote the ferroptosis of tumour cells in vivo. Further studies need to be conducted for the development of this novel and innovative method so that it can be efficiently used in cancer therapy.

Keywords: Anticancer drugs, Nanocatalysts, Cancer therapy, Fenton reaction, Heterocyclic compounds

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