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Synthesis, Characterization, and Cytotoxicity Studies of a Copper(II) Complex with vanillin 3-ethyl-thiosemcarbazone a Ligand

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Synthesis, Characterization, and Cytotoxicity Studies of a Copper(II) Complex with vanillin 3-ethyl-thiosemcarbazone a Ligand

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Abstract

Triple-negative breast cancer (TNBC) is one of the most aggressive and challenging breast cancer subtypes to treat, as these cancer cells lack three common receptors: estrogen, progesterone, and human epidermal growth factor receptor 2. The multiple oxidation states transition metals can occupy; have made this narrowly explored group popular for anti-cancer research in recent decades. Furthermore, the success of cisplatin, which has platinum as a metal center, while being a cancer-fighting agent with serious side effects, has caused other metal centers to be investigated as possible alternatives as chemotherapeutic drugs. Copper, as a biologically essential metal, makes an attractive candidate for a metal center in chemotherapeutic drugs. Additionally, metalbased compounds that contain thiosemicarbazones as ligands possess a wide range of biological activities. These ligands also have anti-cancer properties due to their ability to interfere with enzymes that catalyze DNA synthesis. Moreover, the biomedical activity of the thiosemicarbazones is enhanced by coordination to a transition metal center. Therefore, research involving thiosemicarbazones has become widespread due to their metal coordination capabilities. This study aims to synthesize, characterize, and utilize a copper(II) complex with vanillin 3-ethylthiosemcarbazone as a ligand in cytotoxicity studies. Elemental analysis, high resolution mass spectrometry, ¹H NMR, ¹³C NMR, FTIR, and UV-visible spectroscopies will be utilized to characterize the complex. The cytotoxic activities of the complex will be determined using CCK-8 assay on the human TNBC cell line, MDA-MB-231-VIM RFP. Additionally, the MCF-10A human breast epithelial tissue cell line and cisplatin will be used as a controls in order to determine the efficacy of the complex.

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