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Novia Mann
Old Dominion University

Ifeoluwa Oyeyemi
University of Medical Sciences, Ondo, Nigeria

Duaa R. Alajroush
Old Dominion University

Elizabeth A. Tonsel-White
Old Dominion University

Stephen J. Beebe
Old Dominion University

See next page for additional authors

Author Information

Novia Mann, Ifeoluwa Oyeyemi, Duaa R. Alajroush, Elizabeth A. Tonsel-White, Stephen J. Beebe, and Alvin Holder

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Authors: Novia Mann[1], Ifeoluwa Oyeyemi[2], Duaa Alarjoush[1], Elizabeth Tonsel-White[1], Stephen J. Beebe[3], and Alvin A. Holder[1]
[1] Department of Chemistry and Biochemistry, Old Dominion University, Norfolk, Virginia.
[2] Department of Biological Sciences, University of Medical Sciences, Ondo, Nigeria
[3] Frank Reidy Research Center for Bioelectrics

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, metal-based 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-ethyl-thiosemcarbazone as a ligand in cytotoxicity studies. Elemental analysis, high resolution mass spectrometry, ^{1}H NMR, ^{13}C 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.