SYNTHESIS, CHARACTERIZATION AND ANTI-CANCER APPLICATION OF PLATINUM (II) THIOSEMICARBAZONE COMPLEXES

ABSTRACT

Thiosemicarbazone ligands are an emerging class of N and S donor Schiff base ligands. They have shown important biological applications in anticancer, antimicrobial, antifungal and antiviral therapies. This work involved the synthesis of stable metal complexes to be used as anti-cancer agents. Bias was towards compounds with bulky ligands, because literature reports that such compounds are more stable than those with smaller ligands, hence the drug molecules can get to the target cells in their originally intended state. The ligands chosen for this research were thiosemicarbazones because they are bulky and have shown great potential when used for biological applications. Platinum is a fairly stable metal, hence would help achieve the objective of synthesizing stable drug molecules.

Four thiosemicarbazone ligands and their respective platinum (II) complexes were successfully synthesized and characterized. The synthesis reactions were all performed under mild conditions, and refluxing was the preferred reaction technique. The yields of the thiosemicarbazone ligands ranged between 99% and 89%. The yields of the complexes were between 88% and 77%. The yields of the complexes were significantly lower than those of the ligands, which can be attributed to the steric shielding of the heavy ligands to the platinum metal center. Everything was done under inert conditions, as these compounds had not been reported previously in literature, so their properties and reactivities were unknown. The characterization techniques employed were ^{1}HNMR, ^{13}CNMR, UV/Vis, FTIR, elemental analysis and XRD. The structures of the compounds were fully elucidated and confirmed to be of expected purity.

The anti-cancer activities of the thiosemicarbazone ligands and complexes were performed in *vitro*, against for human cell lines; three cancerous cell lines (CACO, HT-29 and HELA) and the non-cancerous KMST. The data was compared to that of Cisplatin. The results revealed that the ligands had limited anti-cancer activity compared to their complexes. Complexes exhibited varying anti-cancer activity on the different cell lines, and many complexes had better activity than

cisplatin. $C_9H_{13}N_3S_2PtCl_2$ (C2) was better than Cisplatin for HT-29 and CACO cell lines and was minimally harmful to the non-cancerous KMST cells. $C_{14}H_{15}N_3S_2PtCl_2$ (C1) was a good choice for CACO and HT-29, and had a minimal effect on the KMST cells. Altogether, this study shows that these novel thiosemicarbazone (II) complexes can be a promising alternative to other platinum complexes in cancer therapy.