Synthesis, Crystal Structure, Antibacterial and In Vitro Anticancer Activity of Novel Macroacyclic Schiff Bases and Their Cu (II) Complexes Derived from S-Methyl and S-Benzyl Dithiocarbazate

ABSTRACT

A series of novel macroacyclic Schiff base ligands and their Cu (II) complexes were synthesised via reacting dicarbonyls of varying chain lengths with S-methyl dithiocarbazate (SMDTC) and S-benzyl dithiocarbazate (SBDTC) followed by coordination with Cu (II) ions. X-ray crystal structures were obtained for compound 4, an SBDTC-diacetyl analogue, and Cu7, an SMDTC-hexanedione Cu (II) complex. Anticancer evaluation of the compounds showed that Cu1, an SMDTC-glyoxal complex, demonstrated the highest cytotoxic activity against MCF-7 and MDA-MB-231 breast cancer cells with IC50 values of 1.7 μM and 1.4 μM, respectively. There was no clear pattern observed between the effect of chain length and cytotoxic activity; however, SMDTC-derived analogues were more active than SBDTC-derived analogues against MDA-MB-231 cells. The antibacterial assay showed that K. rhizophila was the most susceptible bacteria to the compounds, followed by S. aureus. Compound 4 and the SMDTC-derived analogues 3, 5, Cu7 and Cu9 possessed the highest antibacterial activity. These active analogues were further assessed, whereby 3 possessed the highest antibacterial activity with an MIC of <24.4 μg/mL against K. rhizophila and S. aureus. Further antibacterial studies showed that at least compounds 4 and 5 were bactericidal. Thus, Cu1 and 3 were the most promising anticancer and antibacterial agents, respectively.