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Funded by: NSF-REU Radiochemistry

Synthesis and stability of rhenium tricarbonyl radiotracers

Metal tricarbonyl complexes can be employed for cancer diagnosis and therapy using the radioisotopes Tc-99m or Re-188. These radiopharmaceuticals can be designed with specific physical and biological qualities such as low lipophilicity, high stability, and the capacity to target specific tumors. The goal of this project is to synthesize stable rhenium tricarbonyl complexes that could be integrated into a future radiopharmaceutical. A synthetic method to create metal tricarbonyls has been previously determined; however, preferred ligand systems have not been thoroughly investigated. Selected bidentate and tridentate ligands were used in the synthesis and HPLC was utilized to determine whether the complex remained intact or if solvent exchange had taken place. Complexes derived from bidentate ligands containing a labile chlorine were subject to solvent exchange; however, stability improved when a greater number of π bonds were conjugated to a coordinating nitrogen (6π > 3π > 0π). Tridentate derivatives of pyridine appeared stable in aqueous media and were further analyzed for stability in the presence of cysteine and histidine. These results will be utilized in the development of tricarbonyl radiotracers.