Brett Carney

Major: Chemistry
University: University of Missouri-Columbia
Faculty Mentor: Dr. Silvia Jurisson
Mentor Department: Chemistry
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Radiopharmaceutical research: Coordination of rhenium to tetradentate schiff base ligands

Radiopharmaceuticals, drugs consisting of a radionuclide, are very useful in both the diagnostic and therapeutic treatment of cancer. The radiopharmaceuticals that were researched are composed of Re radioisotopes (Re-186; Re-188), which are very effective in cell destruction. The Re radioisotope must be coordinated to a tetradentate ligand, which would be linked to a biological targeting molecule. The biological targeting molecule is used to guide the radionuclide through the body to the cancer cells. Once it is at the cancer, the radioisotope can then be used to eliminate the cancer. The most challenging aspect of synthesizing a useful radiopharmaceutical is making a drug that will release limited amounts of radiation to other parts of the body before the radionuclide can reach the cancer cells. Therefore, it is extremely important for the radiometal to form a kinetically inert complex so that it will not cause extreme damage to healthy body parts. The primary goal of this study was to synthesize a stable Re(III) complex that could be attached to a biological targeting molecule. First, the tetradentate ligand sal2phen was synthesized. This reaction resulted in a high yield of an orange powder. Next, Re was reacted with the sal2phen to form the complex [Re(V)OCl(sal2phen)], which was fully characterized. This Re complex was then reacted with triphenylphosphine with the intent to make a Re(III) metal center, which is more kinetically inert than the Re(V) metal center. Characterization methods used included IR, Proton NMR, and 31P NMR.