Determining the Ti(IV) sTf Speciation Responsible for Optimal Uptake of Ti(IV) Into Cells

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The most common titanium (IV) species in the human blood of patients with Ti(IV) based implant is serum Transferrin bound titanium. However, it's identity as a one metal species is unclear. It has been proven that an optical uptake of titanium can be achieved with a Ti(IV)-sTf complex. Literature suggests that a mixed metal species, a Fe(III) and Ti(IV) bound species, may be physiologically important for the transport of Ti(IV) into cells Since sTf is commonly found in the blood transporting Iron (III). The specific aims of this experiment are to synthesize two formulations of Ti(IV) and Fe(III)-bound sTf at either lobe, determine the stoichiometry of both species and which complex leads to to optimal uptake of Ti(IV) into the cells. As said, serum transferrin is commonly found in the bloodstream transporting Iron (III) into cells. When entering the endosome of the cell, the protein experiences a change from 7.4 to 5.5 pH level. For this experiment it is vital to understand the mechanism of transportation of Fe(III) bound sTf into cells. We hypothesize the change in pH levels could destabilize the protein which causes the release of Fe(III). For this a DSC was performed of a $Fe(III)_2$-sTf complex prepared at a pH 5.5 and compared to the data presented at our 2016 article in the Journal of American Chemical Society. The data presented no change in apo-sTf at pH 5.5. However, two distinguishable peaks appeared at the Fe-sTf complex at this pH, one at 60 degrees and a second one at 0 degrees; whereas at pH 7.4 there's only one peak at 80 degrees. Future works will include mixed metal species compounds and assays with cells to confirm metal transport into the cell.