Researcher: Deneen

Cole Presentation Title: Characterization of Iron Deposition in Recombinant Heteropolymer Ferritins

Research Focus: Chemistry School: SUNY Potsdam Presentation Type: Poster Presentation

Abstract: Characterization of Iron Deposition in Recombinant Heteropolymer Ferritins Deneen Cole, Dr. Fadi Bou-Abdallah, SUNY Potsdam (NY, USA), Dr. Paolo Arosio, University of Brescia (Italy), Dr. Sonia Levi, Vita-Salute San Raffaele University (Italy) Ferritin is a ubiquitous iron storage and detoxification protein found highly conserved in species from bacteria to plants to humans. In mammals, ferritin is composed of two functionallyand genetically distinct subunit types, H (heavy, ~21,000 Da) and L (light, ~19,000 Da) subunits which co-assemble in various ratios with tissue specific distribution to form a shell-like protein. The H-subunit is responsible for the fast conversion of Fe(II) to Fe(III) by dioxygen (or H2O2) whereas the L-subunit is thought to contribute to the nucleation of the iron core. In the present work, we investigated the iron oxidation and deposition mechanism in two recombinant heteropolymers ferritin samples of ~20H:4L (termed H/L) and ~22L:2H (termed L/H) ratios. Data indicates that iron oxidation occurs mainly on the H-subunit with a stoichiometry of 2Fe(II):1O2, suggesting formation of H2O2. The H/L sample completely regenerates its ferroxidase activity within a short period of time suggesting rapid movement of Fe(III) from the ferroxidase center to the cavity to form the mineral core, consistent with the role of L-chain in facilitating iron turn-over at the ferroxidase center of the H-subunit. In L/H, Fe(II) oxidation and mineralization appears to occur by two simultaneous pathways at all levels of iron additions: a ferroxidation pathway with a 2Fe(II)/1O2 ratio and a mineralization pathway with a 4Fe(II)/1O2 resulting in an average net stoichiometry of ~3Fe(II)/1O2. These results illustrate how recombinant heteropolymer ferritins control iron and oxygen toxicity while providing a safe reservoir for reversible uptake and release of iron for use by the cell.