The Nramp (natural resistance associated macrophage protein) family, found in all kingdoms of life, is an important class of transporters for transition metal homeostasis. Two mammalian Nramp paralogs are required for the dietary uptake and endosomal recycling of non-heme iron, as well as in the innate immune response to intracellular pathogens. We have determined structures of a bacterial Nramp homolog. Using these structures, and other results from computational approaches and biochemical and cell-based functional assays, we arrive at a working model for the conformational change mechanism and metal selectivity of Nramps [1-2]. Our results explain how Nramps specifically discriminate against the highly abundant divalent metals calcium and magnesium, and yet at the same time remain promiscuous in their ability to transport other divalent metals including the toxic metal cadmium. We also describe the molecular mechanism for disease-causing missense mutations in mammalian Nramps.


Keywords: MntH; Nramp transition metal transporter; molecular dynamics
Transition metal transporters are of central importance in the plant metal homeostasis network which maintains internal metal concentrations within physiological limits. An overview is given of the functions of known transition metal transporters in the context of the unique chemical properties of their substrates. The modifications of the metal homeostasis network associated with the adaptation to an extreme metalliferous environment are illustrated in two Brassicaceae metal hyperaccumulator model plants based on cross-species transcriptomics studies. In a comparison between higher plants and unicellularalgae, hypotheses are generated for evolutionary changes in metal transporter complements associated with the transition to multicellularity. Transition metals are defined as those elements that have (or readily form) partially filled d orbitals. The d-block elements in groups 3–11 are transition elements. The f-block elements, also the inner transition metals are in the two rows below the body of the table. The f-block elements are the elements Ce through Lu, which constitute the lanthanide series (or lanthanoid series), and the elements Th through Lr, which constitute the actinide series (or actinoid series). Because lanthanum behaves very much like the lanthanide elements, it is considered a lanthanide element, even though its electron configuration makes it the first member of the third transition series. However, border officials routinely confiscate precious metals from travelers who aren’t aware of them. Failure to Make Obscure Census Filing Leads to Confiscation. According to an article in the Houston Chronicle published in May 2010, U.S. Customs and Border Protection (CB&P) officials at Houston’s George Bush Intercontinental Airport seized nearly $160,000 in gold and silver in one month alone. What surprised me, however, was that CB&P agents seized the gold and silver because the travelers transporting it failed to disclose their holdings on a U.S. Census Bureau’s Shipper’s Export Declaration. You must complete this declaration when you transport certain commodities (including gold and silver) out of the United States if the shipment has a value of $2,500 or more.