# Water-elutability of nucleic acids from metal-chelate affinity adsorbents: enhancement by control of surface charge density.

Fu JY, Potty AS, Fox GE, Willson RC.

Department of Chemical Engineering, University of Houston, Houston, TX 77204-4004, USA.

Immobilized metal affinity chromatography (IMAC) is widely used for purification of proteins, especially "hexahistidine-tagged" recombinant proteins. We previously demonstrated the application of IMAC to selective capture of nucleic acids, including RNA, selectively-denatured genomic DNA, and PCR primers through interactions with purine bases exposed in single-stranded regions. We also found that the binding affinity of nucleic acids for IMAC adsorbents can be increased several-fold by addition of 20 volume% of neutral additives such as ethanol or DMSO. In the present work, it is demonstrated that bound nucleic acids can be effectively eluted with water instead of the usual imidazole-containing competitive eluants, when the surface density of negative charges is enhanced by operation at alkaline pH, or by deliberate metal-underloading of the anionic chelating ligands. With enhanced negative surface charge density, nucleic acid adsorption can be made strongly dependent on the presence of adsorption-promoting additives and/or repulsion-shielding salts, and removal of these induces elution. Complete water-elutability is demonstrated for baker's yeast RNA bound to 10% Cu(II)-underloaded IDA Chelating Sepharose in a binding buffer of 20 mM HEPES, 240 mM NaCl, pH 7. Water elutability will significantly enhance the utility of IMAC in nucleic acid separations. 

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