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Implications from Protein Uptake Kinetics onto Dextran-Grafted Sepharose FF Coupled with Ion Exchange and Affinity Ligands*

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Abstract Our previous studies have reported the presence of "chain delivery" effects of protein adsorption onto ion exchangers with polymer-grafted ion-exchange groups, such as dextran-grafted and poly(ethylenimine)-modified Sepharose gels. However, it is unclear if the "chain delivery" occurs on affinity adsorption with specific interactions. This work is designed to address this issue. A dextran-grafted Sepharose gel was prepared, and then the matrix was modified using diethylaminoethyl, a typical ion-exchange group, or octapeptide (FYCHWQDE), an affinity ligand for human immunoglobulin G (hIgG) to prepare ion-exchange or affinity adsorbents, respectively. Results of hIgG adsorption showed that the uptake rate represented by the effective diffusivity of hIgG onto the dextran-grafted ion exchangers was obviously enhanced by the dextran grafting, indicating the presence of "chain delivery" of the bound proteins on the charged groups on the dextran chains. By contrast, the effective diffusivity of hIgG changed little as ligand density increased on the dextran-grafted FYCHWQDE adsorbents. Their adsorption capacities decreased and effective diffusivities were not accelerated by the dextran grafting. Thus, this work clarified that grafted dextran could not accelerate hIgG uptake rate on the affinity resins, or in other words, chain delivery did not occur on the specific interaction-based affinity adsorption.

Keywords dextran-grafted adsorbent, ion exchange chromatography, affinity chromatography, immunoglobulin G, kinetics

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