Magnetic hydrophobic-charge induction adsorbents for the recovery of immunoglobulins from antiserum feedstocks by high-gradient magnetic fishing

BACKGROUND: The extraction of biopharmaceuticals from plasma and serum often employs overly complicated antiquated procedures that can inflict serious damage on especially prone protein targets and which afford low purification power and overall yields. This paper describes systematic development of a high-gradient magnetic fishing process for recovery of immunoglobulins from unclarified antiserum.

RESULTS: Non-porous superparamagnetic particles were transformed into hydrophobic-charge induction adsorbents and then used to recover immunoglobulins from rabbit antiserum feedstocks. Comprehensive characterisation tests conducted with variously diluted clarified antiserum on a magnetic rack revealed that immunoglobulin binding was rapid (equilibrium reached in <45s), strong (K_d < 0.1 mg mL^{-1}), of high capacity (Q_{max} = 214 mg g^{-1}), and pH and ionic strength dependent. In a high-gradient magnetic fishing process conducted with the same adsorbent, and a conventional ‘magnetic filter + recycle loop’ arrangement, >72% of the immunoglobulin present in an unclarified antiserum feed was recovered in 0.5h in >3-fold purified form.

CONCLUSIONS: Fast magnetic particle based capture of antibodies from an unclarified high-titre feed has been demonstrated. Efficient product recovery from ultra-high titre bioprocess liquors by high-gradient magnetic fishing requires that improved magnetic adsorbents displaying high selectivity, ultra-high capacity and operational robustness are used with ‘state-of-the-art’ rotor-stator magnetic separators.

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