CONTINUOUS PURIFICATION OF MONOCLONAL ANTIBODY USING PERIODIC COUNTER-CURRENT CHROMATOGRAPHY

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Key Words: PCC, continuous purification, concentrated feed-batch, perfusion culture.

Integrated and continuous processing of antibody drugs offers several advantages over traditional batch processing in the biotechnology industry. The flexibility of periodic counter-current (PCC) design is performed in the selection of residence time and column numbers on the capture process. In this study, we investigated the association of residence time and product recovery in the downstream PCC purification. A practical operation of PCC as a continuous capture purification step has been applied to 5L perfusion culture, 5L concentrated fed-batch culture, and 50L fed-bath culture. Using an empirical model for the protein breakthrough curve, residence time (RT) was evaluated and the loading flow rate was adjusted to achieve a target RT of 2.25 minutes for monoclonal antibody (mAb). The sample load volume for each column switching was set on 50 and 58% breakthrough curves, mAb recovery was 88 .4% and 88.9%, and buffer consumption was decreased to under half that of the batch process. Overall, more than 40 grams of purified antibody is obtained in 24 hours using a PCC purification system. Comparison of qualities of mAb analyzed by UPLC and reverse phase chromatography show that glycan profiles and purity are quite similar between antibodies obtained from PCC and batch purification, whereas the acidic variants of mAb purified by PCC is higher than that purified by batch mode. The advantages of a continuous downstream capture step are highlighted for our case study in comparison with the existing batch chromatography processes.