MINIATURIZATION OF CHROMATOGRAPHIC PROCESS DEVELOPMENT: ACHIEVING FAST RESULTS WITH MINIMAL COSTS

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Biopharmaceutical processes heavily rely on chromatographic steps for the purification of their products due to its specificity and better performance than its counterparts. Optimization of chromatographic processes involves the estimation of several parameters and detailed characterization of protein adsorption behavior is needed. This is obtained from protein adsorption isotherms. High-Throughput Screening allows to characterize different resin-protein pairs and process conditions faster, and with lower volumetric requirements. This reduction in sample and materials allows for time saving and cost reduction, particularly significant in the early stages of process development.

Important technologies in this field are liquid-handling stations (LHS) and microfluidics. LHS offer very high automation and consequently minimize handling errors. Microfluidics offers a high degree of miniaturization thus minimizing material and sample consumption, which can be in the micro to nanoliter range. These technologies represent different alternatives for process development, enabling fast process development at very low sample consumption.

This work presents a novel microfluidic chip design for the determination of protein adsorption isotherms in batch uptake mode. The microchip allows for a 100-fold decrease in the amount of resin used, compared to liquid-handling stations. Data were generated with three miniaturization alternatives: microfluidics, liquid-handling stations and Eppendorf tubes. The obtained results allowed to compare operation, implementation, and cost of the different technologies.