High Throughput Experimentation for Downstream Process Development of Vaccines

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Description

Infectious diseases are a growing danger in our society. Vaccination has shown to be a powerful tool to prevent illnesses from infectious diseases. As a result of the high product quality requirements, development times can last up to 20 years. The bottleneck moved from the development of the fermentation to the purification of vaccines.

This PhD project is part of a collaboration project between GlaxoSmithKline and Delft University of Technology with the purpose to reduce the development time of vaccine purification processes by making use of High Throughput Experimentation (HTE) and modeling techniques. The aim of the collaboration project is to establish an vaccine purification process development platform that provides deeper process understanding. The main challenge of the purification process is the reduction of impurities such as host cell proteins (HCP), endotoxins and DNA. Due to the high-resolution purification and the variability in biochemical binding principles, the dominant technique in biopharmaceutical purification and the focus of this project is packed-bed chromatography [1].

Since mechanistic models are derived from fundamental principles, they reflect a higher level of process understanding by describing the fluid flow and mass transfer in chromatographic columns together with the interaction between the sample and resin [1]. In this PhD project, HTE is used to acquire model parameters as input for the chromatographic mechanistic model. HTE enables to reduce the amount of used volume and experimental time providing an automated experimentation platform by the use of Liquid Handling Stations. The objective of the PhD project are the set-up and validation of a high throughput chromatographic platform, as well as the implementation of high-end analytics that are suited for the use in high throughput experiments for accelerated process development of vaccines.

References

[1] A. T. Hanke and M. Ottens, "Purifying biopharmaceuticals: Knowledge-based chromatographic process development," *Trends Biotechnol.*, vol. 32, no. 4, pp. 210–220, 2014.