How to increase sustainability for large-scale peptide API purification?

The peptide drug market has experienced significant growth in recent years and is expected to continue its upward trend in the coming years.

This is supported by a strong pipeline of peptide drugs in development, with many expected to be approved for use in the coming years. In addition to an increasing pipeline, the manufacturing capacity needed for the peptide API is also growing. Indeed, the advent of oral and inhaled peptide products has driven demand for these active pharmaceutical ingredients (APIs).

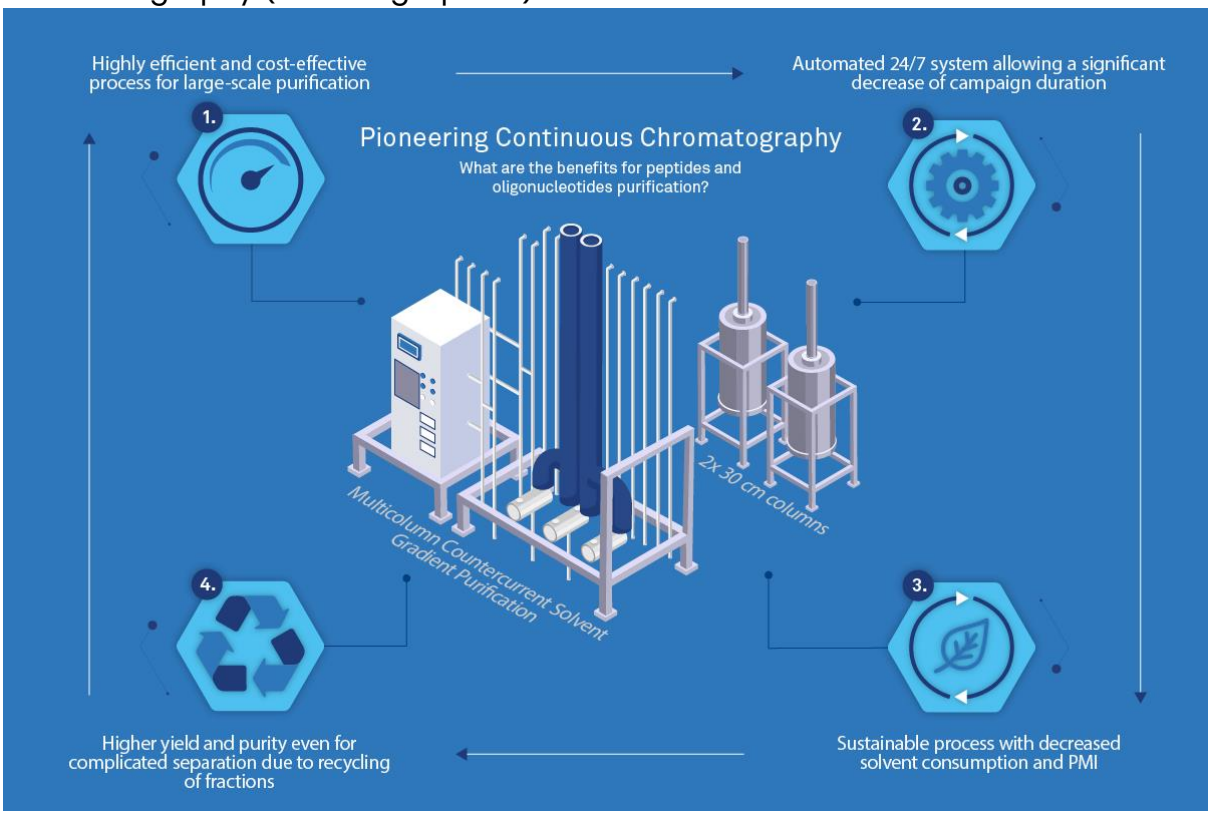
Between 2018 and 2020, the average peptide manufacturing batch size increased 2.3 times in response to a wider variety of peptide drug modalities entering the market. Furthermore, with the launch of new GLP-1 analogs that target metabolic diseases like diabetes and obesity, the need for large-scale manufacturing of these APIs to address large patient populations is growing.

Pharmaceutical companies are now under pressure to meet growing needs of generating several hundred kilograms (kg) of peptide active pharmaceutical ingredients (APIs) per year. One significant challenge currently stands in the way of achieving this goal: providing a sustainable, “green” process for large-scale production. Despite the promise of revolutionary new peptide-based therapeutics, producing the necessary quantities of API is a significant challenge, because of chemicals handled.
For example, when producing glucagon-like peptides (GLPs) – often used in treatments for diabetes and obesity – up to 16,000 kg (about 35273.92 lb) of chemicals could be needed per kg of APIs manufactured. These manufacturing processes use excessive amounts of solvents and produce considerable quantities of waste, especially the purification step.

Therefore, pharmaceutical companies look for a manufacturing partner that can process large-scale demand of a peptide API with:

- Reducing environmental footprint with solvent consumption and waste for large-scale purification
- Having a higher throughput and productivity to speed up manufacturing processes
- Increased yield for a target purity

One of the most critical aspects of peptide production is purification, which ensures that the final product is free from impurities and contaminants. The most efficient approach to peptide purification is chromatography (see infographic 1).



Infographic 1 – Pioneering continuous chromatography

This method involves passing the peptide solution through a column filled with a stationary phase, such as silica or beads, and an elution solvent, such as water or buffer. The peptides will bind to the stationary phase, while the impurities will pass through. Chromatography is a highly efficient and selective method of purification, but it can generate a lot of waste and material consumption at large-scale as well as long operation-time.

Bachem's solution to sustainability and capacity challenges in oligonucleotide and peptide API production was the incorporation of multi-column countercurrent solvent gradient purification (MCSGP) into the downstream process. With this innovative technology in hand, waste, solvents, and operation time are drastically reduced and throughput and productivity are significantly increased.