

# Ensuring biosimilar excellence with Thermo Scientific Core LIMS software

## Key benefits of Thermo Scientific™ Core LIMS software

- Individual users now have immediate access to the information needed for a particular product candidate, and no longer need to search for it manually across systems.
- Pfenex has sped time to production thanks to the ability to quickly determine the appropriate expression strategy by comparing analytical results during process development.

## Challenges surrounding biosimilar development

Pfenex utilizes high-throughput screening to drive their product development process. A single project requires a tremendous amount of data collection and analysis – but when there are five simultaneous experiments, manually keeping track of the data is challenging. This data enables the team to rapidly demonstrate analytical similarity between a Pfenex biosimilar candidate and the reference drug product. The ability to verify the quality of a biosimilar candidate early on in development enables Pfenex to

efficiently progress its entire pipeline of biosimilar candidates. In September of 2015, the Food and Drug Administration (FDA) approved the first biosimilar in the United States (Zarxio), followed by Inflectra, which was launched April 2016.

To ensure quality, safety and efficacy, biosimilars undergo a rigorous review process where the reference product and biosimilar are thoroughly evaluated by the FDA, European Medicines Agency (EMA), and other regulatory bodies. Companies who produce biosimilar products must supply regulators with a large array of data comparing the proposed generic to the approved reference product.

The work surrounding the creation of biosimilars is very complex, and the data package needed to show comparability to the innovator biologic is intensive. There is a tremendous amount of information needed to show that there is no clinical difference in terms of safety, purity, and potency when compared to the original biologic, making a Laboratory Information Management System (LIMS) almost mandatory.

“Pfenex’s documentation practices have dramatically improved as a direct result of tracking experimental parameters, samples, and results in Core LIMS software.”

– James Ware, Group Leader, Downstream Processing

## Using the Core LIMS software for biosimilar development

Pfenex implemented Core LIMS software to organize its in-house data. Their product development capability relies on high-throughput screening (HTS) and accompanying analytical data. Pfenex generates a thousand or more production strains for every expression experiment, which results in several thousand samples to analyze. The company tracks the construction of each one of these strains, and links the associated data using Core LIMS software. This information includes: the genotype and lineage of the strain, and information about the expressed protein; the quality of the protein expressed in that strain; which strains were selected to move forward into scale-up; and the data observed with the strains that were scaled up.

Pfenex closely examines a subset of strains before choosing a production strain. Once a production strain is selected, the lab optimizes the fermentation to increase the titer of soluble, active protein, and then develops a scalable purification process which can be implemented for cGMP manufacturing.

## About Pfenex and biosimilars

Pfenex is a leading-edge biologics company driven by the desire to provide access to safe, effective, affordable products to the market. They have a high-quality protein production and bioanalytical technology platform approach, that allows them to create biosimilars in a highly effective manner (from concept to commercialization). Pfenex is one of the only companies focused on non-glycosylated biosimilars, creating a differentiated platform approach and competitive advantage.

Just as generics are comparable to a branded drug product, biosimilars are comparable to a branded biologic. Biologics, and subsequently, biosimilars, are based on naturally occurring proteins and are produced in living systems.

They are used to treat complex and life threatening diseases, including various types of cancer and autoimmune disorders. Biosimilars play an important role in healthcare, as they provide a low cost alternative to patients that can't afford branded biologics.

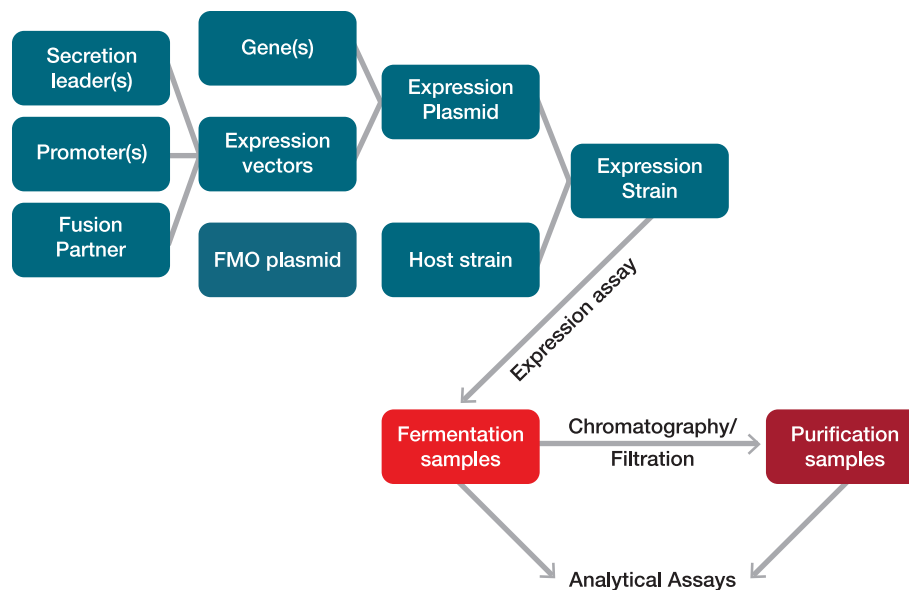


fig.1. Pfenex uses Core LIMS software to support processes throughout their workflow for selection of a production strain.

All of these development efforts are underpinned by an extensive analytical capability that continuously generates large amounts of data for ongoing assessment of

biosimilarity of the product candidate to the reference drug product. Core LIMS software catalogs this data to ensure ease of retrieval and efficiency of assessment.

## Multiple groups at Pfenex use Core LIMS Software as a single data repository

### Molecular biology

The strain is where it all begins. The implementation project focused on bringing the Molecular Biology group online first, as everything is tied to the strain.

### Fermentation

The Fermentation group scales-up production of the selected strain.

### Downstream processing

The Purification of the expressed strain from development to manufacturing is handled by the Downstream Processing group.

### Analytical biochemistry

The role of this group is imperative to the entire process. Analytical testing is used to select strains and analyze quality/quantity through the entire workflow.

## The Core LIMS Software difference

Prior to using a LIMS, Pfenex had data spanning multiple spreadsheets. Locating data often required several hours of sifting through files/folders to find needed information.

Core LIMS software made it possible for users to immediately access the information needed for a particular product candidate, rather than having to search for it manually. With the barcode as a guide, Pfenex staff can now track location, origin, fermentation conditions, genetic makeup of host strain and more. It is now feasible to quickly compare analytical results during process development, and determine whether the differences between the samples are due to different fermentation or processing conditions, production host genotype, or expression strategy.

Core LIMS software is used to track experiments, inventory their components and hazardous chemicals, and automatically calculate key information generated. Overall the LIMS dramatically increases the efficiency of product development efforts which directly translates to rapid, low cost biosimilar development.

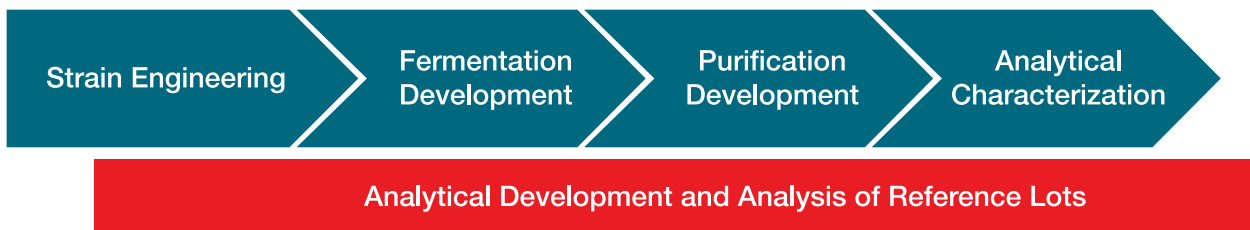


fig.2. An overview of Pfenex's biosimilar development process.

## Next steps

Pfenex is currently planning to transition additional data and groups to the LIMS including migrating the strain database, bringing analytical assays on line, and tracking instrument maintenance. Overall, Core LIMS software has

dramatically increased the efficiency of Pfenex's product development efforts which directly translates to faster, lower cost, biosimilar development.

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