

CMO/CDMO Automates Glycan Workflows to Increase Business Capacity

KBI Biopharma Inc. implemented the Waters UNIFI Scientific Information System to automate and streamline its glycan workflows and expand project capacity to meet growing demand in the biopharmaceutical industry

Technology: Waters UNIFI Scientific Information System, Xevo G2-XS QToF Mass Spectrometer, GlycoWorks RapiFluor-MS (RFMS) Kit

PROTEIN CHARACTERIZATION SERVICES AT KBI BIOPHARMA INC.

KBI Biopharma Inc. is an award-winning biopharmaceutical contract services organization providing fully-integrated, accelerated drug development, and biomanufacturing services to pharmaceutical and biotechnology companies globally.

KBI Biopharma Inc. has worked closely with each of 300+ client partners to personalize and rapidly accelerate its drug development programs. They have built upon a foundation of world-class analytical capabilities to deliver efficient process development and clinical and commercial cGMP manufacturing services for mammalian, microbial, and cell therapy programs.

Most recently, through KBI's acquisition of Elion Labs and Alliance Protein Labs, along with the expansion into Belgium to provide analytical services for the European market, KBI established the most powerful analytical capabilities in the biopharma CDMO industry.

A key driver of this continued success in analytical services is the Mass Spec Core Facility at KBI Biopharma Inc.'s Durham site.



The Mass Spec Core Facility at KBI Biopharma Inc.'s Durham site.

WORKING WITH WATERS

KBI Biopharma Inc.'s Mass Spec Core Facility has worked with Waters for a number of years and the laboratory currently uses several Waters™ Xevo™ mass spectrometers for its protein characterization services. During the purchase and implementation of its newest Waters instrument – the Waters Xevo G2-XS Quadrupole Time-of-Flight (QToF) Mass Spectrometer – the company saw an opportunity to automate its glycan profiling workflow with the Waters™ UNIFI™ Scientific Information System.

Dr. Michael Nold, Director of the KBI Biopharma Inc. Mass Spec Core Facility, explains the appeal of UNIFI for glycan profiling: *“We were interested in introducing the technology to improve our productivity and throughput. Additionally, UNIFI helps us with 21 CFR part 11 compliance and cGMP compliance. It made sense to onboard UNIFI for our work today and our plans for the future.”*



A scientist at KBI Biopharma Inc. working on Waters instrumentation.

This lab provides deep in-house analytical capabilities for KBI clients and has tripled in size in a short time period, tackling a wide-range of projects relating to:

- Monoclonal antibodies (full length mAbs, domain antibodies, antibody conjugates, fragments)
- Fusion proteins
- Multi-specific antibodies and proteins
- Protein vaccines
- Biosimilars, biobetters, biosuperiors
- Other recombinant protein drugs
- Proteomic work flows
- Host Cell Proteins
- Personalized Medicine
- Peptide drugs

Dr. Michael Nold is responsible for directing the business strategy around mass spectrometry within KBI Biopharma Inc. One area of growth is the increasing need for glycan profiling. Dr. Nold and his team of scientists began exploring the use of the Waters UNIFI Scientific Information System to improve the laboratory's glycan workflow capabilities.

MASS SPECTROMETRY FOR PROTEIN CHARACTERIZATION

Regulatory agencies have identified biotherapeutic glycosylation as a critical product and process quality attribute. As such, the pharmaceutical industry has made the characterization and monitoring of a product's glycosylation profile a standard component of the drug development and manufacturing process.

Glycosylation can be assessed and monitored at the intact glycoprotein, protein subunit, glycopeptide, and released glycan levels. The gold standard for glycan profiling is UltraPerformance Liquid Chromatography™ coupled with mass spectrometry (UPLC™-MS).

With the consolidation of its North Carolina MS capabilities in the Mass Spec Core Facility, KBI Biopharma Inc. positioned itself to provide its clientele with sequence verification and developability data which can support proof-of-concept, initial structural characterization for investigational new drug application (IND) filings, or comprehensive impurity characterization for biologics license application (BLA) licensure.

The KBI Biopharma Inc. Mass Spec Core Facility in Durham focuses specifically on MS assays, and the team collaborates with other groups in the company to do other analytical chemistry assays. Together, these internal groups create the final reports on the characterization, stability, and other studies for clients.


 "Mass spectrometry is among the most powerful analytical techniques available for protein characterization. We're doing characterization either from a manufacturing program or even a standalone program that provides a thumbprint of the biomolecule from a MS point of view. KBI Biopharma Inc.'s state-of-the-art Mass Spec Core Facility delivers unparalleled structural characterization services to our clients."

DR. MICHAEL NOLD

Director, KBI Biopharma Inc. Mass Spec Core Lab

These studies are used in preparation for an IND filing with the U.S. Food & Drug Administration (FDA) and preparation for clinical trials, so it's vital that KBI Biopharma Inc. scientists provide their customers with the right data with the right insight at all stages of development.

GLYCAN PROFILING WORKFLOW AUTOMATION

KBI Biopharma Inc. has expanded its work in glycan profiling over the years because of growing customer demand, spurred by the regulatory agencies that look at the consistency of the glycan profiles as part of the compliance process.

Recent advances in analytical instrumentation and software have dramatically improved the available tools for efficient glycan profiling workflows. Previously, the Mass Spec Core Facility relied on 2AB and procainamide approaches for glycan profiling. While effective, the work was time consuming and required a high level of scientific expertise from KBI Biopharma Inc. staff members.

In 2018, KBI Biopharma Inc. added the Waters Xevo G2-XS QToF mass spectrometer with UNIFI to the Mass Spec Core Facility to increase the laboratory's capacity, as well as provide an additional backup to the company's other Xevo mass spectrometers currently in use.

During the process of implementing the Waters Xevo GS-XS mass spectrometer, Dr. Jeremy Woods, KBI Biopharma Inc. Group Leader and Senior Scientist, began identifying ways to streamline and automate therapeutic glycoprotein analysis, from sample preparation through to data analysis. While evaluating the Waters GlycoWorks™ RapiFluor-MS™ (RFMS) Kit, the Mass Spec Core Facility team was introduced to the Waters UNIFI Scientific Information System.



Dr. Michael Nold, Director of the KBI Biopharma Inc. Mass Spec Core Facility.

"Our original workflow was a very time-consuming process. Our researchers were getting the results, doing calculations and then looking up that information manually in a database. The UNIFI approach that we're now implementing will automate that process, including some processing of the mass spectral data to generate a peak list with molecular weights, and then instantly comparing that to the database to determine the glycan that corresponds to each peak. That enables us to provide quicker delivery because we can do more work in a given amount of time."

DR. JEREMY WOODS

Group Leader and Senior Scientist,
KBI Biopharma Inc.

Typically, data acquisition, processing, and report generation have been distinct activities in a laboratory environment. The UNIFI Scientific Information System was designed to harmonize software solutions that were once separated, creating an integrated laboratory informatics platform.

UNIFI is the first software platform to provide a single solution for UPLC-MS that encompasses data acquisition, processing, visualization, reporting, and configurable compliance tools within a networked laboratory environment. It also provides support for regulatory compliance and product quality control.

The Waters system provided KBI Biopharma Inc. an opportunity to significantly reduce the time required to conduct glycan profiling by providing rapid access to results through efficient data acquisition and processing steps. The UNIFI platform is designed to be easy to use, with workflows and templates that help researchers efficiently move from analysis to reports. UNIFI's data mining and comparison capabilities also offered the ability to understand results with an unparalleled capability to aggregate and manage data. That capability enables companies like KBI Biopharma Inc. to realize tremendous productivity gains from their process.

While the Mass Spec Core Facility team is still determining the resulting time savings, Dr. Nold estimates that it could be a 50–80 percent improvement over the original procainamide workflow. In addition to faster data generation and analysis, Dr. Nold sees advantages in UNIFI's ability to build, create, and share comprehensive reports quickly and easily, as well as the ability to meet regulatory compliance demands. That also enables KBI Biopharma Inc.'s MS scientists to share their knowledge with both internal and external collaborators, as well as support their clients' ability to make business-critical decisions expeditiously.

As another bonus, Dr. Nold has discovered UNIFI can potentially speed up the training process for new laboratory staff as well as enable staff members with less MS-specific expertise to be more efficient. He explains: "Before, maybe three people in the laboratory could do our glycan profiling work. Now everyone on our team will be able to do it because the workflow is streamlined and it's easier to do. Plus, the UNIFI workflow is easy for them to learn right out of the gate. They're not having to unlearn something. They're learning to do it the right way from the get-go."

Dr. Nold summarizes the effect of UNIFI on the company's glycan profiling projects as: "With the RFMS glycan workflow in UNIFI, it's more efficient for the analysts doing the work, and for the clients receiving the reports."

NEXT STEPS

The Waters UNIFI Scientific Information System will provide KBI Biopharma Inc. scientists with the ability to quickly move from analytical methods to automated data processing to confirming sample knowledge to reporting findings. That supports the company's larger mission to ensure projects move more smoothly, quickly, and accurately – resulting in accelerated decision making, improved laboratory effectiveness, and products getting to market faster.



The Waters Xevo G2-XS ToF with an ACQUITY™ UPLC H-Class System, as used in KBI's laboratory.

While implementing UNIFI was originally focused on automating KBI Biopharma Inc.'s glycan profiling work, the Mass Spec Core Facility leadership team is also looking at how UNIFI can improve their workflows for other types of analyses. Dr. Nold has plans to evaluate the UNIFI Biopharmaceutical workflow specifically. UNIFI incorporates a full range of application-specific solutions, which also include forensic toxicology screening, metabolite identification, natural products, pesticide screening, regulated bioanalysis, and screening.

Success in the biopharmaceutical industry requires seeing both the bigger picture and the long-term possibilities. The KBI Biopharma Inc. leadership team understands that it's important to invest in resources today that will make it easier to launch new projects in the future.

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