

Improving Standards for Vitamin Analysis using Mass Detection

Waters™ ACQUITY™ QDa™ Mass Detector, ACQUITY UPLC,™ and Empower™ 3 Chromatography Data Software bring the power of mass detection to Amway, creating a partnership to strengthen industry best practices in vitamin analysis

TECHNOLOGY: ACQUITY QDA MASS DETECTOR AND EMPOWER 3 CHROMATOGRAPHY DATA SOFTWARE (CDS)

NUTRITIONAL SUPPLEMENTS AT AMWAY

One of the world's largest direct sales businesses, Amway, has its products distributed in nearly every corner of the world. In 1959, the company launched its business model selling home products directly via its representatives, and Amway has expanded over the years to become a global leader in several industries, including the health (dietary supplements) and beauty markets.

The company manufactures and sells more than 4,000 products across the globe. These products are produced in partnership between Amway's many geographic markets as well as with the company's global partners. It's a worldwide operation, centered on one research and development (R&D) laboratory and two quality control (QC) laboratories in North America. The company also has three laboratories in China, one manufacturing plant and one QC lab in India, as well as one QC lab in both Japan and Korea.

At Amway's Michigan, USA, headquarters, Dr. Amit Chandra, Manager of the Chromatography Services Group, leads the company in navigating the Research and Development environment of vitamin and nutritional supplements. One of his team's big-picture goals is to lead the industry by spearheading the development of improved standards for vitamin analysis using mass detection.

This complex mission impacts Amway's global laboratory footprint, so the technology needs to be adaptable. Dr. Chandra explains: *"Different countries have different regulations. We have to comply with all of them, so we need the flexibility to align to different regulations, environments, and mandates."*

As such, in partnership with Waters, Amway has strived to take a leadership role in the vitamins and nutritional supplements industry by developing and sharing best practices in vitamin analysis using the latest in mass detection technology.



The Research and Development team, Amway, Michigan, USA.

WORKING WITH WATERS

Amway's sales model is based on the power of interpersonal relationships, and that philosophy extends to the company's relationships with its partners and vendors as well. The partnership with Waters helped spark Amway's early adoption of the ACQUITY QDa Mass Detector.

Dr. Chandra explains: *"We are one of the early users of the QDa in the industry, thanks to our partnership with Waters. We quickly adopted the technology because we saw what it could do for us."*

Dr. Chandra adds: *"Amway and Waters co-attend meetings like AOAC and share our experiences together. The relationship has been very beneficial to us."*

Team members from Amway and Waters established and shared their results on the impact of mass detection for routine QC analysis. Technical presentations at industry conferences, such as AOAC International, are improving the standards for vitamin analysis and increasing confidence in results for the dietary supplements industry.



Dr. Amit Chandra, Manager of the Chromatography Services Group, Amway.

MASS DETECTION TECHNOLOGY FOR VITAMIN TESTING

Amway's Michigan, USA, laboratory is the center of Amway's R&D operations – providing research, discovery, development, and support activities for the products made and sold by the company. These products range from household goods to nutritional supplements to health and beauty products. But vitamins and nutritional supplements hold some unique challenges for the company's R&D and QC teams.

Vitamin manufacturers are subjected to regulatory requirements, although dietary supplements are not reviewed or approved by the FDA in the United States. Because Amway products are sold globally, they must comply with the different regulations in different countries. These ever-changing regulatory demands require more and more information, sparking the need for both more specific data and more efficient ways to store and report the results.

Always on the lookout for new and improved technology, Amway was interested in tapping into the analytical confidence that mass detection brings via the Waters ACQUITY QDa Mass Detector. They quickly saw the potential to solve the company's challenges with vitamin analysis.

Dr. Chandra was particularly impressed with the QDa's ability to provide LC users with access to mass spectral data without the need for an extensive training in mass spectrometry. He also saw an opportunity to lead the way in developing best practices for vitamin analysis leveraging mass detection.

Working in synergy with optical detection, the QDa can significantly reduce the chance that a sample component will go undetected. Amway saw the benefits of minimizing the risk of unexpected coelutions or components while confirming trace components with certainty – which is particularly important for vitamin analysis.

Integrating the QDa mass detection into their LC labs also helped Amway enhance the analytical capability and productivity of each analysis and eliminated the need to run additional assays or time-consuming alternative techniques. And it worked seamlessly with their current systems – including Waters Empower 3 Chromatography Data Software (CDS), which Amway scientists use extensively.

Dr. Chandra describes the impact of mass detection in the Amway laboratories: *"The old methodology was becoming outdated, and we needed to find ways to improve it. The QDa solves our problems in detecting levels of analytes for multi-vitamin products in food and beverages."*

ADVANCING VITAMIN ANALYSIS

Amway is dedicated to assuring its consumers about the quality of the products they buy.

As Dr. Chandra puts it: *"We want to prove that what's advertised on the bottle is what's inside the product, wherever it's sold."*

The Michigan R&D laboratory is the center of that process. Dr. Chandra calls his laboratory a *"one-stop chromatography shop for Amway's global partners and affiliates."*

The Michigan R&D lab works with many Amway products, but vitamins are particularly challenging. The formulations are complicated, combining many ingredients – some present at trace levels. Older methods were time-consuming and tedious. And as regulatory demands change, the company needed enhanced information that could not be met by optical detection alone.

Dr. Chandra explains: *"The challenge for us is to choose the right instrumentation and technology to design new methods for identification, quantification, method validation, method transfer to QC and sustainability of those methods."*

The size of Amway's operations made choosing the right instrumentation critical. Working with other Amway laboratories and global partners requires a great deal of coordination, which Dr. Chandra eloquently describes as *"harmonization,"* where methods and data transfers seamlessly, thanks to the cutting-edge analytical technology.



"We want to have the same instrumentation in our labs around the globe. It makes sharing of technology and transferring of technology very seamless and easy. Even though the science is the same, if we have the same instrumentation, it is more efficient when we share our methods globally."

DR. AMIT CHANDRA

Director of the Chromatography Services Group

Dr. Chandra and his team have spent the past few years working diligently towards harmonizing Amway's laboratories by investing in the latest technology, aided by their long-standing relationship with Waters.

The ACQUITY UPLC, ACQUITY QDa, and Empower 3 CDS offered an opportunity to work towards their goal of harmonization, particularly because the instrumentation and software met the needs of both R&D and QC scientists at Amway.

METHOD TRANSFER

Transferring methods from R&D to QC isn't always straightforward. When Amway's R&D scientists develop methods in their lab, their goal is to detect anything they want to and quantitate anything they discover. The company's QC scientists, however, need accurate and precise results in a reasonable amount of time because, naturally, the manufacturing process depends on fast turnaround times.

Amway has found using the same instrumentation in different locations helps the organization easily transfer methods between laboratories – particularly between their R&D and QC teams. The ACQUITY QDa Mass Detector streamlined Amway's method transfer process, making it easier to transfer methods from the specific requirements of R&D to the routine analysis needs of QC. It also offered an easy way to integrate mass detection into the company's existing workflows.

Dr. Chandra explains: *"You don't see QC labs using LC-MS/MS on a routine basis because it is not very consistent from an instrumentation perspective. The QDa is the answer to routine analysis. It is much easier and simpler to run methods on the same instruments."*

TRACE-LEVEL ANALYSIS

Vitamin analysis is a complex process, requiring the simultaneous determination of many different analytes in samples. That's complicated by the chemical properties of vitamin compounds, particularly those present in trace levels. The sensitivity of the ACQUITY QDa Mass Detector has made it possible to achieve the trace-level analysis needed in food, beverages and dietary supplements, especially for vitamins.

Additionally, by combining separate vitamin analyses into a single run, Amway scientists can increase their sample throughput, reduce solvent consumption, and decrease their operational costs while still targeting compounds at low concentrations.

Dr. Chandra explains: *"Our use of the Waters ACQUITY QDa Mass Detector has come at a very good time, because it brings sensitivity, low-level detection, clean and easy sample prep to our methods. Vitamin analysis has become so specific, particularly for Vitamins D, B, and C. The QDa has helped harmonize our vitamin analysis so we can use a single method in our laboratories across the globe. It's a welcome change."*

EASY SAMPLE PREPARATION

Sample preparation is time-consuming, something both Amway's R&D and QC scientists want to minimize. Easy sample preparation enabled by the ACQUITY QDa saves a lot of time, yet still offers the sensitivity to detect trace-level analytes, which is particularly beneficial for vitamin analysis.

Dr. Chandra describes the impact in the laboratories: *"We had multiple steps to clean the samples because we need a cleaner sample when we use a regular instrument. It took time and multiple steps to make the sample ready for analysis. Using the ACQUITY QDa Mass Detector simplified our sample preparation process, so we can do more in less time."*

EASY INTEGRATION

While Amway scientists have used and continue to use LC-MS/MS technology, it didn't always fit the needs of Amway's manufacturing workflows. The easy integration of the ACQUITY QDa has brought affordable mass detection to the company that was also user friendly.

Dr. Chandra explains: *"The size and the footprint of the QDa is one of the biggest advantages. It fits right into our existing system. We can get consistent results with the QDa that weren't possible with LC-MS/MS. I don't need a Ph.D. in mass spectrometry to work a QDa. A trained analytical chemist can use it. It is plug and play, even in different laboratory environments."*

Easy integration with Amway's Empower 3 CDS was another important factor. Empower helps laboratories to automate many manual tasks – cutting out some of the more tedious work so Amway scientists can focus on other, more important assignments. It also cuts down on the on-boarding process for new laboratory technicians.

Dr. Chandra explains: *"We don't want to spend a year training someone. We need our instrumentation to be comprehensible and easy to grasp."*



Waters ACQUITY QDa Mass Detector in the R&D laboratory, Amway.

DATA MANAGEMENT

For manufacturers, where a great deal of time goes into following regulatory requirements and maintaining compliance documentation, mass detection helps organizations meet the regulatory demands of today – and tomorrow. That includes an ever-increasing demand for more data, as well as more specific data.

The combination of the ACQUITY QDa Mass Detector and Empower 3 CDS offers a better way to store and access data, helping organizations move from hard copies to digital data.

That enables companies like Amway to cut down on paper and recycling waste, as well as the related storage issues and time consumption.

Reporting and compliance documentation is also streamlined, saving even more time and resources.

REGULATORY COMPLIANCE

For regulatory agencies, if it's not documented, there's no evidence that it happened. To make matters more complicated, standards are rapidly evolving. Mass detection offers enhanced confidence in analytical results, helping companies meet changing regulatory demands.

In addition to data management, data validation is an important part of maintaining regulatory compliance. Amway laboratories are moving from a manual process of checking analysis results to a streamlined workflow that enables teams to validate data right using Empower. This saves time as well as makes it easier to automate QC documentation.

Dr. Chandra explains: *"We have to keep records of all our testing. We trace everything back to what equipment was used, if our instrument is compliant, and when it's been maintained. Waters instrumentation and Empower have helped us streamline that process, saving us time and resources."*

INSOURCING

Like many large organizations, Amway works with contract labs for some of their analytical needs, particularly for complex techniques involving traditional mass spectrometry that required high levels of expertise.

However, Amway soon realized they could obtain the mass spectral data they needed from the ACQUITY QDa, enabling them to bring some of this outsourced work back into their internal laboratories. The turnkey mass detection technology of the ACQUITY QDa made it easy and affordable for Amway to achieve mass data in less time without requiring extensive training in mass spectrometry.

Insourcing is particularly valuable to manufacturers because it helps companies like Amway maintain control of critical production as well as save costs in labor and shipping. But most of all, it saves a lot of time.

Dr. Chandra says: *"It used to take three days to get results that the QDa now can do in-house in approximately two hours."*

THE FUTURE OF VITAMIN ANALYSIS

The analysis of nutrients like vitamins in food and beverages is rapidly changing, thanks to shifting regulatory requirements and the game-changing capabilities of mass detection technology. Amway plans to continue and expand the company's leadership role, working together with Waters to develop industry-standard methods for adoption.

Dr. Chandra believes the ACQUITY QDa offers companies like Amway a new way to harness the power of mass detection to meet the regulatory demands of today and tomorrow. For the first time, this turnkey solution makes it easy and affordable for Amway scientists to confidently see more information in less time without requiring extensive training in mass spectrometry.

Working in synergy with optical detection, the ACQUITY QDa offers food and beverage scientists the ability to significantly reduce the chance that a sample component will go undetected, while at the same time minimizing the risk of unexpected coelutions or components while confirming trace components with certainty. Additionally, for global companies like Amway, the easy integration and streamlined workflows of the ACQUITY QDa make it more efficient to transfer methods across sites, saving time and helping to make collaborations between locations or partners faster and easier.

Dr. Chandra sees the potential as Amway and Waters lead the way in developing best practices for vitamin analysis using mass detection. Together, the companies plan to continue to focus on the development of standardized, chemical analysis methods that will impact the entire industry.

Amway currently has five ACQUITY QDa Detectors in their North American laboratories, with a plan to add more as the demand for the technology increases. Dr. Chandra anticipates more chromatographers will see the inherent benefits of adopting mass detection in their labs.

Dr. Chandra remarks: *"The ACQUITY QDa is amazing. It is the best in the world."*

Thanks to Bertil Nshime, R&D Research Scientist, and Prescott Chen, QC Research Scientist of Amway.

Waters

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