HORIBA

Fluorescence

Cell Culture Media Analysis: Qualitative and Quantitative Analysis using the Veloci™ BioPharma Analyzer

Application Note
Life Sciences
FL251701

Background and Challenges

Cell culture media used in bioprocessing are inherently complex, making it difficult to quickly assess lot-to-lot variability, track key components such as amino acids and vitamins, and manage time-consuming sample preparation and separations for analysis. This high matrix complexity presents major challenges for monitoring and ensuring consistency, while optimizing performance.

Traditional measurements, such as pH and osmolality, offer only limited insight, whereas more comprehensive techniques, like HPLC or LC-MS, though powerful, are often slow, and require extensive sample preparation. To overcome these limitations, A-TEEM™ (Absorbance-Transmittance Excitation Emission Matrix) spectroscopy provides a powerful alternative—enabling rapid, detailed molecular fingerprinting of complex media without the need for separations. This makes it ideally suited for efficient, high-resolution analysis of media composition in both research and manufacturing environments.

Qualification and Quantification Analysis

In this study, twelve individual lots of a commercially available yeastolate-based cell culture medium were analyzed to assess lot-to-lot variability. Samples were prepared using a PBS buffer (pH 7.4) as the diluent, achieving a final concentration of approximately 0.3 mg/mL. Each lot was prepared in triplicate across two separate days to capture both preparation and day-to-day variability.

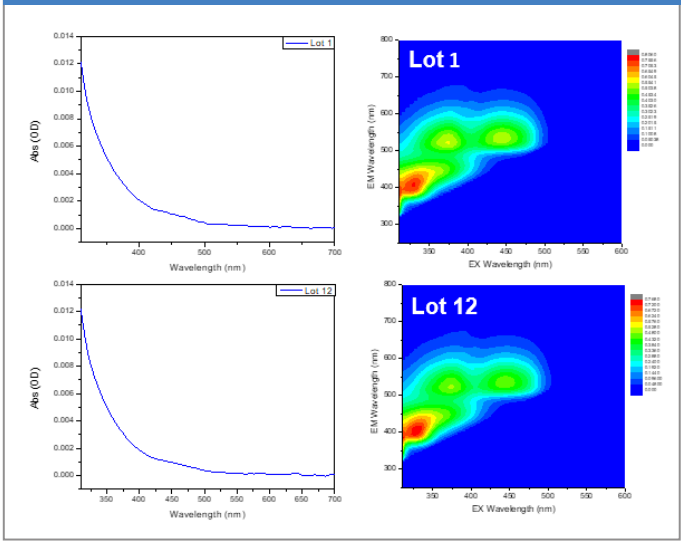
Veloci™ BioPharma Analyzer

Quantitative Analysis

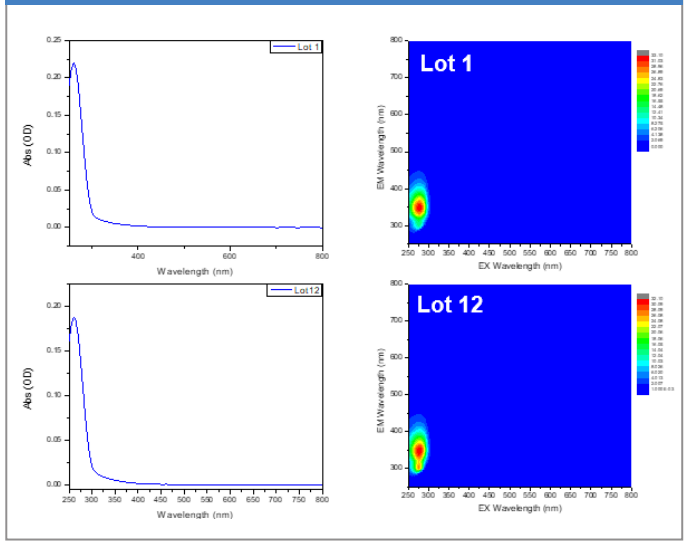
Lot #	Trp (%)	Tyr (%)	Pyridoxin (%)	Folic Acid (%)	Riboflavin (%)
1	0.65±0.02	0.76±0.02	0.03±0.00	4.26±0.23	0.04±0.00
2	0.65±0.03	0.76±0.05	0.03±0.00	4.15±0.18	0.04±0.00
3	0.65±0.02	0.76±0.03	0.04±0.00	3.40±0.28	0.04±0.00
4	0.65±0.03	0.76±0.03	0.03±0.00	3.70±0.41	0.04±0.00
5	0.65±0.02	0.76±0.04	0.03±0.00	3.94±0.24	0.04±0.00
6	0.65±0.02	0.76±0.02	0.03±0.00	4.21±0.34	0.04±0.00
7	0.65±0.02	0.76±0.02	0.03±0.00	3.61±0.35	0.04±0.00
8	0.65±0.01	0.76±0.03	0.03±0.00	3.75±0.26	0.04±0.00
9	0.65±0.04	0.76±0.04	0.03±0.00	4.11±0.24	0.04±0.00
10	0.65±0.01	0.76±0.04	0.03±0.00	4.49±0.14	0.04±0.00
11	0.65±0.03	0.76±0.05	0.03±0.00	4.35±0.20	0.04±0.00
12	0.65±0.03	0.76±0.07	0.03±0.00	3.94±0.39	0.04±0.00

Qualitative Analysis

Typical A-TEEM Profile for Vitamins Region



Typical A-TEEM Profile for Aromatic Amino Acid Region



Conclusion

This study demonstrates the potential of A-TEEM™ spectroscopy as a rapid and reliable tool for evaluating lot-to-lot variability in complex cell culture media. By leveraging the distinct spectral fingerprints of aromatic amino acids and vitamins, A-TEEM enables sensitive tracking of compositional differences without the need for extensive sample preparation or lengthy separations.

In addition to qualitative discrimination, A-TEEM provides quantitative insights into media composition, offering a powerful, efficient approach for quality control and process optimization in biopharmaceutical applications.

Features and Software Package

- GMP compliance ensures data integrity and regulatory compliance with built-in audit trails, PDF report generation, & login authentication
- QA/QC toward Process Analytical Technology (PAT) for manufacturing control
- Batch EEM/A-TEEM processing tools
- Pass/Fail Application for comparing new data to reference data in both 2D and 3D modes

EzSpec™

Analysis software for intuitive and secure data handling. Its user-friendly apps and v2 Datastore make navigation, filtering, and file searches easy.

EzPAT™

PAT enterprise server, developed under OPC UA protocols, provides connectivity with common platforms used to control process analytics, while enabling regulatory compliance.

A-TEEM™ Direktor

Analysis software for modeling and interpreting A-TEEM data offers a step-by-step workflow for calibration, and supports models like PARAFAC, PCA, and PLS.

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