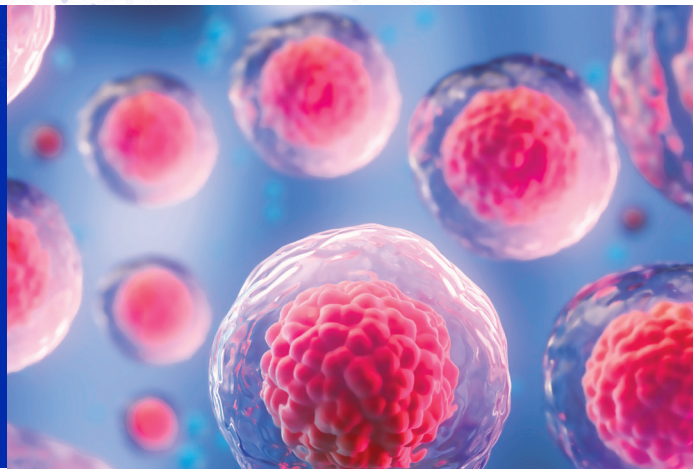
Osmolality: A Powerful Tool in Bioprocessing

To develop biologics, osmolality is a key process parameter, the team at The Center for Breakthrough Medicines offers insights on their work with the OsmoTECH® XT.



Over the past decade, biotech research has greatly focused on cell and gene therapies, which have shown great promise in the treatment of a broad variety of indications, including rare and orphan diseases with high unmet need. In this era of precision medicine, cell and gene therapies move us closer to true personalized medicine: This means patients' experience and quality of life during treatment are crucial considerations during the development of these advanced therapies.

The Center for Breakthrough Medicines is a contract development and manufacturing organization working on innovative cell and gene therapies. Their services are aimed at accelerating speed to market for advanced therapies. "We are able to apply our knowledge of microbiology and expertise to help propel cell and gene therapy research forward," explains Kayla Pasake, Research Associate for Analytical Development at The Center for Breakthrough Medicines. "We are helping companies accelerate the delivery of safe and effective therapies to patients."

Osmolality is a key process parameter in cell and gene therapy

Such innovative approaches require a robust bioprocessing workflow – from research to product development to GMP manufacturing. Therefore, precise and accurate process control strategies – such as the use of osmolality testing – are critical to optimize the product yield and help drug developers overcome the obstacles of poor performance. Because osmolality is one of the most important process control parameters, testing it can ensure purity and consistency of biopharmaceutical products throughout the bioprocess workflow, from upstream to downstream and to the final formulation and filling process.

"When we purchased the Advanced Instruments OsmoTECH XT, we were in start-up mode in the labs and developing our assays," Pasake says. "At the beginning, we needed a small, easily transportable osmometer. At the same time, we needed an instrument we could also use later on when we would finally move into the GMP phase." Pasake's requirements exemplify optimal biotech development: the ability to use one instrument to meet a range of requirements during process development and, later, GMP manufacturing. By using one instrument to meet these requirements, scientists can address and resolve potential manufacturing concerns early in process development. This accuracy and efficiency saves both manpower and money later in the scale-up phase[1].

"Osmolality testing is crucial for process development, analytical development and GMP testing. We need to meet the regulatory requirements for the product to be released to the market or to be released to go to a patient."

Kayla Pasake, Research Associate for Analytical Development at The Center for Breakthrough Medicines

Osmometers need to accurately measure the widest variety of sample types

Osmolality testing has a very broad range of applications: from maintaining optimal cell growth to ensuring active pharmaceutical ingredient purity and yield or confirming quality during fill and finishing. "When you are in the process development stage, you need an osmometer with a wide range," says Pasake. "That wide range is what is key, and that's also what stood out for us with OsmoTECH XT. In the beginning, you never know which kind of samples you're going to test, and this osmometer offers an amazing range of osmolality testing: from 0 to 4000 mOsm/kg H_2O."

As the pharmaceutical industry is moving towards higher concentration formulations, it is critical to have an instrument that can measure such high concentrations with optimal performance in order to ensure that the final product is safe for administration. Companies try to develop low-volume, high concentration injections in order to alleviate patient pain and increase patient compliance. The OsmoTECH XT uses freezing point depression technology to accurately and reliably determine the osmolality of these concentrated protein formulations.

Minimal sample volumes are key during process optimization

When the sample size is greatly limited, it may be necessary to test osmolality on very small volumes. Small sample volumes improve test flexibility, especially when bioprocessing workflows need to be optimized. "The sample volume is important," explains Pasake. "With the OsmoTECH XT, we are able to test 20 microliter samples. Other osmometers have a sample volume of 100 microliters, which doesn't seem like a lot. But when you are in the cell and gene therapy field, where you are working on therapies that will go into patients right away, or you are doing patient samples, you want to use the smallest sample possible."

Data integrity and data management features are an integral part of Advanced Instruments' osmometers

Data integrity is a crucial feature to help ensure the validity of the data and their analyses. Osmometers with integrated compliance features help ensure reliability, consistency, and accuracy of data throughout the bioprocessing workflow. The OsmoTECH XT technical features support 21 CFR Part 11, Annex 11, and Pharmacopeia compliance. Moreover, the data features are flexible to meet the growing needs of organizations while also helping GMP organizations meet local and global regulations. The data management features also support integration into a company's system and allow the company to optimize the review of their data as they streamline their processes. The integrated barcode scanner helps with sample identification and reduces transcription errors.

"The OsmoTECH XT is 21 CFR part 11 compliant, which was extremely important to us to support our GMP testing," remarks Thomas Majernick, Lab Manager Analytical Development at The Center for Breakthrough Medicines. "Because we're currently using this osmometer to develop our platform assays and our platform methods, we also need to meet the compendium requirements for USP <785>. So having data integrity compliance already within the system during process development means there is one less parameter we need to consider during scale-up. We can also check the audit trails. And another deciding factor for the purchase was the OsmoTECH XT's ability to integrate with our LIMS." As both technology and the industry move forward, it is crucial for manufacturers to guarantee full compliance with the regulations and to safeguard data integrity.

The driving factor for innovation: Steady customer communication

In order to support all of a customer's requirements during the entire process – from product development to GMP manufacturing – close collaboration is a keystone of Advanced Instruments' philosophy. From the first demo to the purchasing process, from IQOQ validation to support on data management issues, a constant information exchange is key to ensure optimal implementation of osmolality testing.

"The virtual demo of the OsmoTECH XT was really helpful and showed us how to use the instrument, especially in these times when onsite demos are not always possible," says Pasake. "We also did a virtual IQOQ, and it was actually fantastic. It took almost ten hours but went smoothly, and Advanced Instruments' technical service representative walked us through each step. Even if this osmometer is extremely user-friendly and straightforward, it's great to be able to reach out to customer support and get answers in a timely manner."

Advanced Instruments' customer-centric approach and constant dialogue with their customers are driving forces in the innovation process of the biotech and pharmaceutical industry. This steady flow of information also helps ensure high-quality, quick, and efficient processes which deliver cutting-edge therapeutics and ultimately benefit the patient.

References

[1] Campbell, A., Brieva, T., Raviv, L., Rowley, J., Niss, K., Brandwein, H., Oh, S., and Karnieli, O. (2015, October). Concise review: Process development considerations for cell therapy. Stem cells translational medicine. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4572896/.

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