Revolutionising Upstream Bioprocessing: A Cutting-Edge Tool for Enhanced Process Analytics and Control

Implementing representative quality control standards, to achieve greater process insights, multisite trending and equipment validation.

By Yoggya De Silva Sharma, Senior Research Scientist & Quality Assurance, PCS Biotech

UPSTREAM BIOPROCESSING requires strict control of Critical Process Parameters (CPPs) as they greatly affect therapeutic protein productivity and product quality[1]. Prior to AccuCell®, scientists in R&D and process engineers in manufacturing, relied solely on manufacturer quality control (QC) standards for upstream analytical equipment. Whilst manufacturer QCs confirm equipment performance against manufacturer specifications, these controls are not representative of culture media formulations.

The principle of using third-party controls or External Quality Control (EQC) standards is a well-established practice in clinical diagnostics. ISO 15189:2022 states that "the use of third-party QC material should be considered, either as an alternative to, or in addition to, control material supplied by the reagent or instrument manufacturer"[2]. For biopharmaceutical production, ICH Q2(R2) Validation of Analytical Procedures notes that "a linear relationship between analyte concentration and response should be evaluated across the range of the analytical procedure to confirm the suitability of the procedure for the intended purpose"[3].

AccuCell® EQCs are designed and formulated to mimic eukaryotic cell culture media, providing a more representative sample matrix for routine analysis than alternative aqueous controls. 100% chemically defined, animal component free, AccuCell® EQCs do not contain any substances foreign to typical culture media, i.e., preservatives, emulsifiers, or bovine albumin, which could alter the sample interaction with sensor technology.

Testing was performed and verified on two BioProfile® FLEX2 analysers, one BioProfile® pHOx and one StatProfile® Prime analyser (Figures 1 – 3). The AccuCell® range delivered analytical results within specification for all three analysers. Samples did not require unique analytical modes, e.g, QC mode or Proficiency, to achieve desired outcomes. Standard sample mode was used for all testing to represent process sample analysis.

In summary, AccuCell® EQC's wide concentration range makes them ideal for validating system (or automated) dilutions, Performance Qualification (PQ), linearity testing, and enhanced process insight, improving process efficiency and product Critical Quality Attributes (CQAs) with higher-level control of Process Analytical Technology (PAT) equipment.

Figure 1. AccuCell® EQC 140 pH

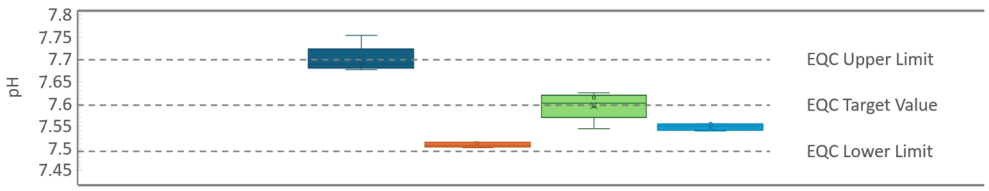


Figure 2. AccuCell® EQC 110 pCO_2

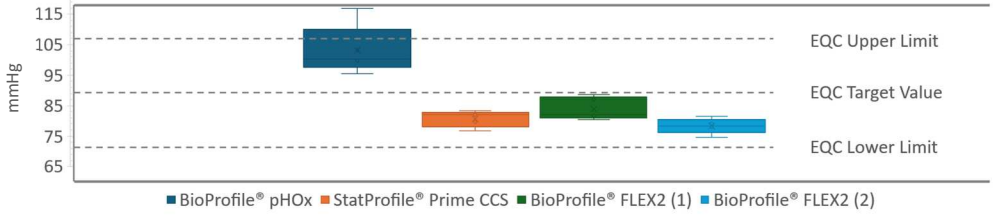
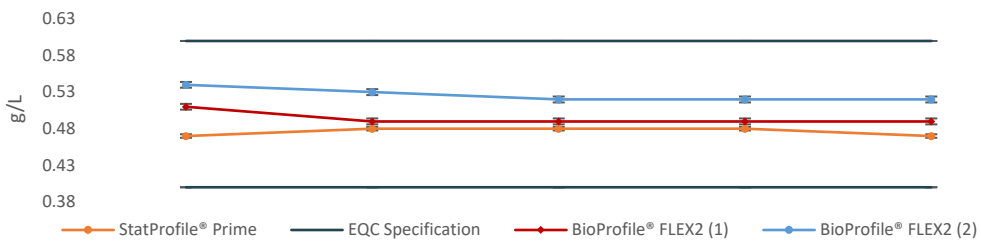


Figure 3. AccuCell® EQC 110 Glucose



References:

1. Brunner, M., Fricke, J., Kroll, P. et al. Investigation of the interactions of critical scale-up parameters (pH, pO2 and pCO2) on CHO batch performance and critical quality attributes. Bioprocess Biosyst Eng 40, 251–263 (2017). https://doi.org/10.1007/s00449-016-1693-7
2. ISO 15189:2022 Medical laboratories — Requirements for quality and competence (Edition 4, 2022).
3. Q2(R2) Validation of Analytical Procedures, March 2024 (https://www.fda.gov/regulatory-information/search-fda-guidance-documents/q2r2-validation-analytical-procedures)

PCSBiotech