Workflow Impact with Bio-Rad InteliQ QC on Beckman Coulter DxC 700 AU Instrument

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Abstract

Background: The emergence of automated instrumentation has been a growing trend in the past decade. As a result, there has been more demand for automated methods to run quality control (QC). In 2021, Bio-Rad expanded a suite of InteliQ controls addressing the need for QC automation on major platforms, including Beckman Coulter.

The objectives of the study were to determine if the Bio-Rad InteliQ Controls function properly on the Beckman Coulter DxC 700 AU chemistry analyzer from a hardware/software perspective and identify QC workflow efficiencies gained (reduction in processing steps and savings in time) when compared to the current Bio-Rad QC method of using conventional controls in vials.

Methods: Over a 5-day period, the InteliQ controls were stored in DxC 700 AU designated QC racks in an off-board refrigerator and loaded onto the analyzer when QC needed to be performed. This process was compared to the current QC process where the control material from vials is aliquoted into sample cups for each different control used. The study was conducted at two sites (AMITA Hinsdale Medical Center (Hinsdale, IL, U.S.A) and AMITA Bolingbrook Medical Center (Bolingbrook, IL, U.S.A).

Results: Both sites saved an average of 4 minutes (60% average time savings) in the daily QC Pre-run and Post-run Process while utilizing InteliQ controls. According to the time collection table, each operator spent 6 minutes 47 seconds for the vial process and about 2 minute 45 seconds with the InteliQ process. Both operators believed that the InteliQ process eliminated the need to transfer material to sample cups and the need to dispose of the sample cup from the rack in each QC run.

	QC Pre-Run Process	QC Post-Run Process	Total Time
Current Process	6 min 21 sec	26 sec	6 min 47 sec
InteliQ Process	1 min 27 sec	1 min 18 sec	2 min 45 sec
		Time Savings	4 minutes 2 sec

Conclusion: InteliQ streamlined the sites' QC workflow on the Beckman DxC700 AU, saving each lab an average of 4 minutes (60% average time savings) per QC run.

Introduction

Performing Quality Control (QC) processes is an integral component in the laboratory's Quality Management System. The QC process monitors and verifies that laboratory instruments are performing optimally. However, the daily task of performing QC can be time-consuming, labor intensive, costly and prone to error. Laboratories are looking for ways to improve the QC workflow, reduce time and eliminate errors without compromising on the reliability and timeliness of producing patient results.

Bio-Rad's InteliQ controls are designed to allow load-and-go capabilities for programmable instruments with applicable on-board QC storage for some instrument. Once the tube is placed in a QC rack on the instrument, the instrument stores the QC, runs the appropriate analytes at the scheduled frequency, and returns the QC to the on-board storage without requiring operator intervention. Additionally, laboratories that have other instruments without on-board storage have expressed an interest in running InteliQ controls as the value of eliminating some of the repetitive tasks and reducing potential manual errors to prepare and analyze the quality control in the lab would be beneficial.

Bio-Rad and Beckman Coulter worked collaboratively to assess the workflow benefits of using InteliQ chemistry controls on a Beckman Coulter DxC 700 AU System. The controls were placed into QC designated instrument racks and stored off-board in the refrigerator for use as needed. Using the load-and-go process, the QC rack was placed directly on the instrument for the daily QC processing.

The objectives of the study were to assess the functionality of the InteliQ controls using the load-and-go process on the DxC 700 AU, and to identify workflow efficiencies (reduction in QC processing steps and time savings) compared to laboratory's current QC method and processes.

Materials

Instrument: Beckman Coulter DxC 700 AU Chemistry Analyzer (Brea, CA, U.S.A.)

Quality Control: Bio-Rad InteliQ Controls (Irvine, CA, U.S.A.)

Catolog Number	Quality Control	Lot Number	Expiration
12008256 - 12008258	InteliQ Assayed Multiqual	45870T	04/30/2023
12008299 - 12008301	InteliQ Ethanol Ammonia	54330T	03/31/2022
12009941-12009943	InteliQ Immunology	68960T	06/30/2022
12009995-12009996	InteliQ Urine Chemistry	88100T	06/30/2022

Methods

DxC 700 AU Instrument QC Setup

Setup Step	Detail	Instruction Source
QC Setup	Program InteliQ controls for QC analysis (parameter fields)	Reference manual (section 2-43)
Enable barcode operation	Select barcode operation (code 128)	Reference manual (section 2-44)
Configure QC panel	Select tests to be run for each InteliQ control ID	Instructions for use (section 2-9)
Enable automatic QC on multiple bottles	Enable checkbox to allow for QC testing on multiple bottles of the same assay	Instructions for use (section 2-38)

Bio-Rad InteliQ Control Preparation

1. To thaw the frozen product, the tubes were allowed to stand at room temperature (18-25°C) until completely thawed.
2. Once thawed, the InteliQ tubes were placed into a DxC 700 AU designed QC rack (green) and promptly returned to 2-8°C storage.

QC Testing Procedure

1. InteliQ controls are stored tightly capped in the DxC 700 AU designated QC racks in an off-board refrigerator
2. Daily, with the InteliQ caps on, the rack with tubes are gently inverted several times to ensure homogeneity
3. The tube caps are removed
4. The QC rack with the InteliQ tubes is inserted into the DxC 700 AU instrument rack feeder
5. Run/Start is initiated
6. The DxC 700 AU identifies the InteliQ barcode label and automatically performs the pre-programmed panel of tests for each QC tube processed
7. After completion of the QC sampling, the rack is removed and the InteliQ tubes are recapped and returned to off-board refrigerated storage

The above procedure was performed daily for five (5) consecutive days.

Results

AMITA Hinsdale and AMITA Bolingbrook both followed the same protocol used for processing QC. The current process refers to the process of using individual QC vials and aliquoting the material into individual sample cups for each different control.

A total of thirteen (13) steps were identified to process each individual QC sample vial. Total elapsed time to complete the process was:

Site	Total Elapsed Time
AMITA Health Adventist Medical Center Hinsdale	7 minute 32 seconds
AMITA Health Adventist Medical Center Bolingbrook	6 minutes 11 seconds

The current process steps and time required for each step is listed in Table 1.

For the InteliQ process, the DxC 700 AU QC rack with the barcode labeled tubes were removed from the off-board refrigerator and loaded directly onto the analyzer for processing. The InteliQ process steps and time required for each step is listed in Table 2. Total elapsed time to complete the process was:

Site	Total Elapsed Time	Time Savings	(%) Reduction
AMITA Hinsdale	3 minutes 10 seconds	4 minutes 22 seconds	60% savings
AMITA Bolingbrook	2 minutes 20 seconds	3 minutes 51 seconds	65% savings

Overall, both sites reduced the QC processing time by an average of 60% compared to the current steps.

In addition QC process steps were reduced with the implementation of the InteliQ QC tubes as shown in Table 3.

Tables

Table 1. Current QC Processing Steps and Times to Complete

QC Process	QC Process Description	Hinsdale	Bolingbrook
		Current Process	Current Process
QC Pre-run Process	Go to refrigerator and remove QC products and take them to workbench	7 min	5 min 51 sec
	Locate and identify QC products to be run		
	Load sample cups into barcoded QC tubes in green rack		
	Gently mix QC bottles		
	Remove caps and open QC bottles		
	Using transfer pipette, aliquot QC material into sample cups		
	Dispose of pipette tips		
	Replace caps on QC bottles		
	Return QC products to refrigerator storage		
	Transport QC rack from workbench to analyzer and load in rack feeder		
	Run START		
QC Post-run Process	After QC run is complete, remove QC sample cups and dispose in biohazard waste	32 sec	20 sec
Total Elapsed Time		7 min 32 sec	6 min 11 sec

Table 2. InteliQ Processing Steps and Times to Complete

QC Process	QC Process Description	Hinsdale	Bolingbrook
		InteliQ Process	InteliQ Process
QC Pre-run Process	Go to refrigerator and remove DxC 700 AU QC rack with InteliQ tubes	1 min 40 sec	1 min 14 sec
	With tubes still on, gently invert QC rack to mix		
	Remove InteliQ caps		
	Transport QC to DxC 700 AU analyzer and load in rack feeder		
	Run START		
QC Post-run Process	After QC run is complete, replace InteliQ tube caps	1 min 30 sec	1 min 6 sec
	Return QC rack to refrigerator		
Total Elapsed Time		3 min 10 sec	2 min 20 sec

Table 3. QC Processing Steps Eliminated Using InteliQ QC Tubes

QC Processing Steps Eliminated Using InteliQ
Locate and identify QC vials to be processed
Load disposable sample cups into DxC 700 AU QC racks
Aliquot individual QC material into each sample cup using a disposable transfer pipette
After completion of QC, dispose of individual sample cups into biohazard trash

Conclusions

Bio-Rad InteliQ controls, when used with a modified load-and-go process in combination with the Beckman Coulter DxC 700 AU advanced QC capability, demonstrated an average time savings of 60% when compared to the laboratory's current process. Much of the time savings came from elimination of the labor-intensive tasks of identifying control material, aliquoting controls into sample cups, and manually programming QC runs. In addition, the InteliQ process could potentially reduce pour-off errors, reduce costs associated with disposables and waste removal, and eliminate errors and rework due to manual entry of QC analyte information entered into systems.

In conclusion, InteliQ controls, together with the Beckman Coulter DxC 700 AU, can help laboratories increase efficiency and maximize workflows by providing easy to use, load-and-go quality controls.

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