

CASE STUDY: *Medium-Size US Reference Laboratory*



Streamlined Sample Result Management



The DPC Immunoassay (IA) Workcell provides the clinical reference laboratory with a low-cost, flexible solution for streamlining sample processing in both batch and routine environments. Linking multiple immunoassay instruments with the SMS creates a single location for adding samples, reviewing results, and managing repeat testing. In addition, the IA Workcell allows operators to load samples onto the SMS using clinical chemistry racks, eliminating sample sorting between these two platforms.

The present case study demonstrates how one laboratory was able to streamline sample handling in both batch and routine testing environments by taking advantage of the features offered by the IA Workcell. Specifically, batch testing was completed in half the time required by stand-alone instruments, with only a fraction of the labor. In routine testing, the laboratory eliminated sample sorting between chemistry and immunoassay platforms by providing a single location for loading samples via either DPC or Olympus clinical chemistry racks. Consequently, the lab decreased the number of operator interventions by 65 percent, and reduced operator time at the instrument during each intervention by 35 percent. In addition, the laboratory completed all testing (total work time) 17 percent faster by loading samples more quickly and eliminating delays in launching repeat testing due to excessive searching to locate samples.

Laboratory profile

Laboratory Size	Medium US reference laboratory (500 IA tests/day, 300 IA samples/day)
Instrumentation	One IMMULITE® 2000, one IMMULITE® 2500
Staffing	Two medical technicians running chemistry and IA
Shifts	Most routine testing performed on third shift. Batch testing performed once a month during health fairs for wellness testing.
Reagent Loading	Virtually no testing replication across instruments because of the large number of different tests run across immunoassay instruments (~40).
Sample Loading	Single sample used for clinical chemistry and IA. Chemistry tests run first, and then samples sorted for required IA testing. Samples sorted at the IA bench for each IA instrument. In addition, some samples routed to both instruments, depending on testing mix.
Result Review	Manual review of all results; results tagged and sent to LIS
Repeat Testing	Samples removed immediately after pipetting, requiring operator to search for samples for repeat testing (i.e., autodilutions / reflex testing)

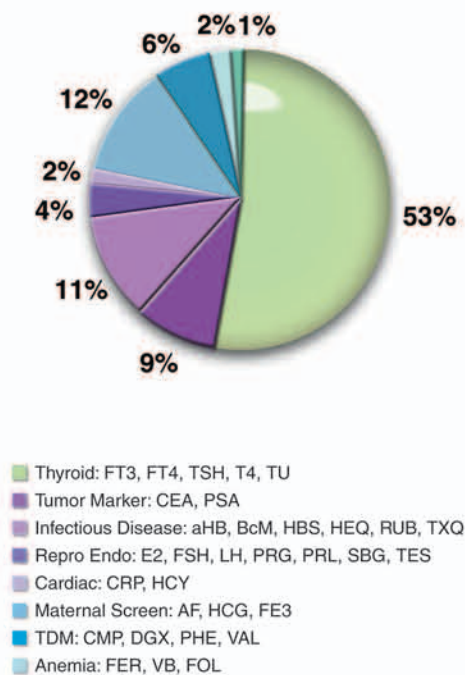


Figure 1. Laboratory immunoassay test menu and test volumes.

Challenges

This laboratory was faced with the following challenges, which are prevalent among typical growing reference laboratories.

- Streamline batch testing and improve result turnaround time (TAT)
- Reduce or eliminate sorting between clinical chemistry and immunoassay testing.
- Eliminate sample searching for repeat testing

Laboratory modifications to streamline workflow

To address the laboratory's concerns, the IA Workcell was added to the testing paradigm. This addition, along with recommendations for sample loading in batch and routine environments, yielded significant increases in usable walk-away time for the operator and improved result TAT.

Batch testing

The laboratory sponsors health fairs on a monthly basis to provide wellness testing for the surrounding community. This produces large batches of 300 to 500 samples that arrive in the laboratory all at once. Historically, this testing took place during three shifts. Samples arrived in the lab in the early afternoon, and all test results were completed in the early hours of the following morning. The testing required a significant amount of labor, as the operator would constantly feed samples to two separate instruments. Once pipetted, samples were

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removed from the instruments, requiring the operator to search for patient samples that needed repeat testing (i.e., reflex testing or autodilutions).

Integrating the IA Workcell provided a single sample-entry point for all samples, and extended the sample capacity to 350 samples (75 on each IMMULITE 2000/2500 plus 200 on the SMS). This additional capacity allowed the laboratory to load almost all samples at one time, requiring only one operator intervention (i.e., operator trip to the SMS). In addition, samples were retained on board until all tests were completed, eliminating the need to search for samples requiring repeat testing. With improved sample handling and reduced operator intervention, the health fair batch testing was completed in one shift, requiring just one operator intervention (Figure 2). This allowed the laboratory to utilize the staff more effectively while batch testing was in progress, and provided same-day reporting of patient results.

Routine testing

During routine testing, the lab uses one primary tube for both chemistry and immunoassay analysis. This requires the operator to identify where a sample needs to be processed and the best, most efficient route for completing all tests. A further complication is the need of some samples to be sorted between immunoassay and chemistry instruments, and, on occasion, between multiple immunoassay instruments. Historically, operators spent a great deal of their time and attention manually sorting samples before processing, which caused a significant delay in result TAT.

The IA Workcell enabled the laboratory to link IMMULITE 2000 and IMMULITE 2500 instruments, providing a single entry point for loading samples. This eliminated the need to sort samples across instruments because the SMS determined where samples were to go for processing. In addition, the use of Olympus rack carriers on the SMS allowed seamless loading of all samples processed on the Olympus clinical chemistry analyzer directly onto the SMS without sorting through tubes to determine whether immunoassay testing was required. Instead, the SMS determined whether a test was requested on either of the connected instruments, and routed the sample accordingly. To streamline reflex testing, the operator retained all samples on board until all tests produced results, eliminating the need to search for samples that required repeat testing. Instead, when repeat tests were requested, the SMS automatically retrieved the appropriate sample for analysis. The SMS decreased the average time to launch a repeat test from 30 minutes to 1 minute (Figure 3).

By incorporating these changes into laboratory operations and taking full advantage of the benefits of the IA Workcell, the laboratory realized significant improvements in operator efficiency and result TAT. Specifically, the number of operator interventions required for loading samples, removing samples, sorting samples, and reviewing results was decreased by 65 percent (Figure 4). In addition, the total amount of time spent at the instrument during these interventions was decreased by 35 percent (Figure 5). Therefore, samples were processed more quickly, decreasing the time required to result all tests by 20 percent (Figure 6)

Conclusions

The DPC IA Workcell enables the reference laboratory to streamline sample processing in both batch and routine testing, thereby reducing sample-handling requirements and providing faster result TAT. In batch testing situations, this is accomplished through an increased instrument capacity of up to 350 samples at once, decreasing the need for multiple operator interventions. By reducing batch testing to a single-step procedure, the operator is free to tend to other laboratory tasks, samples are processed more quickly, and same-day results are possible. In a routine testing environment, the SMS provides a single sample-entry point for two instruments, eliminating the need to sort samples across multiple immunoassay instruments. In addition, clinical chemistry racks are loaded directly on the IA Workcell, eliminating the need to sort samples between chemistry and immunoassay instruments. Finally, the additional sample capacity allows the operator to retain samples on board until all repeat tests are completed, eliminating time spent searching for samples, and improving result TAT.

The IA Workcell's features translate into significant productivity improvements in the clinical laboratory, namely, more efficient operators and instruments. This added efficiency allows medical technologists to eliminate non-value-added tasks such as sample sorting and searching, and to concentrate on using the skills they learned in their training.

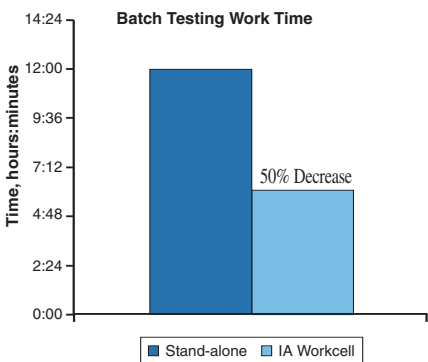


Figure 2. The IA Workcell allowed the laboratory to load nearly all of the samples of a large batch that arrived all at once. This involved one operator intervention and decreased batch testing work time by 50 percent.

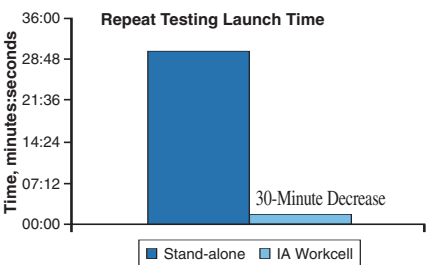


Figure 3. The IA Workcell dramatically decreased the average time to launch a repeat test by automatically retrieving samples. All samples remained on board until all tests produced results, eliminating the need to search for samples requiring repeat tests.

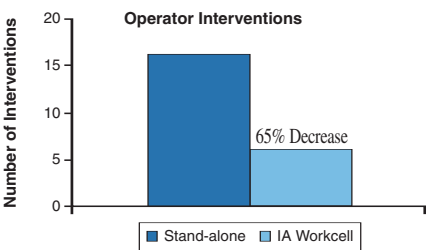


Figure 4. By taking full advantage of the IA Workcell's features, the laboratory realized a 65 percent decrease in operator interventions.

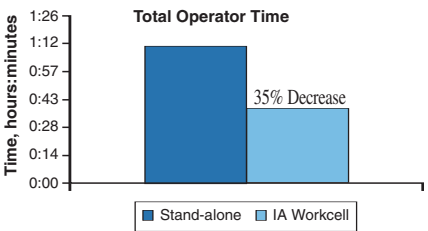


Figure 5. Total operator time spent during interventions was decreased by 35 percent.

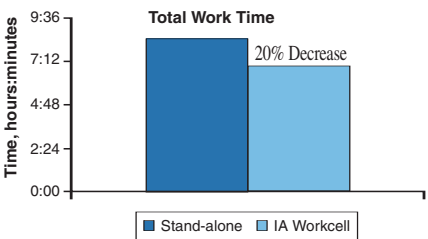


Figure 6. Samples were processed more quickly with the IA Workcell, and the time required to result all tests decreased by 20 percent.