# Workflow Comparison of Automated Analyzers for Autoimmune Testing


## Abstract

As autoimmune testing volumes continue to rise, clinical laboratories face increasing pressure to improve operational efficiency while managing staffing shortages and cost constraints. This case study presents a comparative evaluation of two diagnostic workflows for antinuclear antibody (ANA) testing. Workflow efficiency was assessed based on daily operating time and a composite metric encompassing start-up, maintenance, analyte testing, and resulting activities. Observational time-and-motion studies were conducted at two independent laboratories using routine clinical workflows. The findings highlight differences in total operating time and manual labor requirements, which may inform decisions related to laboratory result throughput, staffing, and resource optimization.


## Background

Autoimmune testing volumes in the U.S. are projected to double by 2030, with a 10.7% annual growth rate.[1] At the same time, laboratories face persistent staffing challenges: demand for medical laboratory technicians (MLTs) is expected to grow 13% by 2026, while 7.2% of positions currently remain unfilled.[2] These trends place increasing pressure on labs to manage higher testing volumes with limited personnel and constrained budgets.

ANA testing, a primary component of autoimmune diagnostics, presents additional workflow complexity due to the number of analytes and the use of reflex testing algorithms. These factors contribute to increased analyzer and technologist demands, making operating time and efficiency critical considerations for managing ANA testing workflows.

This study compares two diagnostic analyzers used for ANA screening and reflex testing with a focus on operating time to assess workflow efficiency.

## Methods

Two observational workflow studies were conducted at large clinical laboratories in the central United States — one affiliated with an academic medical center and one within a multi-hospital health system — to evaluate the BioPlex™ 2200 System (Bio-Rad Laboratories, Inc.) and the Phadia 250 System (Thermo Fisher Scientific Inc.).

The Phadia 250 System uses a fluorescence immunoassay method that requires separate tests for each analyte. The BioPlex 2200 System utilizes a multiplex method to perform testing of all individual ANA analytes in a single test using one reagent kit.

An independent workflow consultant measured duration times for setup, calibration, analyte testing, and maintenance tasks, capturing both manual labor time and analyzer processing time. Data were collected during routine analyzer use over multiple days at each site and averaged for analysis. The test volumes used in this study reflect ANA screening and reflex testing volumes for nine specific analytes from a representative clinical laboratory (Table 1).

**Table 1. Testing volumes from a representative clinical laboratory.**

| ANA analyte | Monthly test volume |
|---|---|
| ANA screen | 325 |
| dsDNA (double-stranded DNA) | 325 |
| SS-B (La) | 43 |
| SS-A (Ro) | 43 |
| Centromere | 43 |
| Jo-1 | 43 |
| RNP (ribonucleoprotein) | 43 |
| Sm | 43 |
| Scl-70 (topoisomerase I) | 43 |
| Ribo P (ribosomal P protein) | 43 |

## Results

The duration times for start-up, maintenance, analyte testing, and resulting activities for both systems are summarized in Table 2. Each activity includes manual labor and analyzer processing times.

The BioPlex 2200 System had a total operating time of 2 hr 40 minutes per day, compared to 5 hr 31 minutes for the Phadia 250 System.

## Discussion

The BioPlex 2200 System completed the evaluated ANA workload in 52% less total operating time than the Phadia 250 System (Table 2). Manual labor time accounted for much of this reduction, with the BioPlex 2200 System requiring 66% less manual labor time (Table 3). Time savings were observed across start-up, maintenance, analyte testing, and resulting activities.

Among all workflow activities, the largest total time difference occurred in analyte testing, where the BioPlex 2200 System required 69% less total time (Table 2) and 90% less manual labor time (Table 3) than the Phadia 250. This difference was due to the BioPlex 2200 System's multiplex method, which processed all nine ANA analytes in a single test. In contrast, the Phadia 250 required separate tests for each analyte, adding manual processes and extending analyzer run times.

Resulting time also showed a substantial difference, with the Phadia 250 requiring 20 minutes of manual labor each day to review positive ANA results and order reflex testing for each individual analyte (Table 3). In comparison, the BioPlex 2200 System required no time for resulting activities, as its multiplex format automatically generated all ANA screen and reflex results within a single test.

For start-up and maintenance, the BioPlex 2200 System required 15% less total start-up time and 44% less total maintenance time (Table 2), driven primarily by reduced operational requirements. Multiplex reagents allowed use of a single reagent pack, calibrator set, and control set for all ANA tests, whereas the Phadia 250 required separate reagent kits, calibrators, and controls for each test, increasing hands-on time.

While this analysis focused on workflow metrics, other factors — such as assay performance, test menu, reagent costs, and instrument footprint — were not evaluated. Additionally, because the data were collected from two independent laboratories with differing operational practices, results may vary in other settings. Future studies under standardized testing conditions could further validate and expand these findings.

## Conclusion

This study compared workflow metrics for ANA screening and reflex testing on the BioPlex 2200 System and the Phadia 250 System, evaluating start-up, maintenance, analyte testing, and resulting activities. Across all categories, the BioPlex 2200 System required less total time than the Phadia 250 System, with the largest difference observed for analyte testing time. The reduction in operating time translates into improvements in workflow efficiency, which may help laboratories manage higher testing volumes with limited personnel or constrained budgets. Reducing daily operating time and manual labor requirements can allow labs to reallocate staff to other tasks, optimize scheduling, and improve overall operational flexibility. Further evaluation using standardized testing conditions could help confirm and expand upon these findings.

**Table 2. Total operating time per day (hh:mm).**

| Workflow activity | BioPlex 2200 System | Phadia 250 System | % Reduction |
|---|---|---|---|
| Start-up | 1:28 | 1:44 | –15% |
| Maintenance | 0:18 | 0:32 | –44% |
| Analyte testing | 0:54 | 2:55 | –69% |
| Resulting activities | 0:00 | 0:20 | –100% |
| **Total operating time** | **2:40** | **5:31** | –52% |

**Table 3. Manual labor time per day (hh:mm).**

| Workflow activity | BioPlex 2200 System | Phadia 250 System | % Reduction |
|---|---|---|---|
| Start-up | 0:22 | 0:43 | –49% |
| Maintenance | 0:09 | 0:13 | –31% |
| Analyte testing | 0:02 | 0:20 | –90% |
| Resulting activities | 0:00 | 0:20 | –100% |
| **Total manual labor time** | **0:33** | **1:36** | –66% |

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References

1. Fortune Business Insights (2025). Autoimmune disease testing market size, share & COVID-19 impact analysis, by product type (instruments and reagents & consumables), by disease type (rheumatoid arthritis, systemic lupus erythematosus, scleroderma, vasculitis, inflammatory bowel disease, and others), by test type (antinuclear autoantibody, rheumatoid factor, C-reactive protein, anti-thyroglobulin antibody, and others), by end-user (hospital & clinics, diagnostic centers, and others), and regional forecast, 2023-2030, accessed July 7, 2025.
2. American Society for Clinical Laboratory Science (202). Addressing the clinical laboratory workforce shortage, accessed July 7, 2025.



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