BECKMAN COULTER
Life Sciences

Flexible ELISA automation with the Biomek i5 Workstation

Summary

- Automated ELISA assay workflow
- Optimized liquid transfers eliminate the need for a plate washer
- High-capacity deck accommodates fresh tip usage

Enzyme-linked immunosorbent assays (ELISAs) are a common analytical tool for detecting the presence of a protein or other molecules of interest. While the workflow is broadly conserved (Figure 1), numerous reagent addition and wash steps make this a labor-intensive endeavor. Automation of these steps not only relieves this labor burden but can lead to improvements in result consistency. Here we demonstrate the automation of an IL-22 ELISA (R&D Systems) on the Biomek i5 Automated Workstation (Figure 2A).

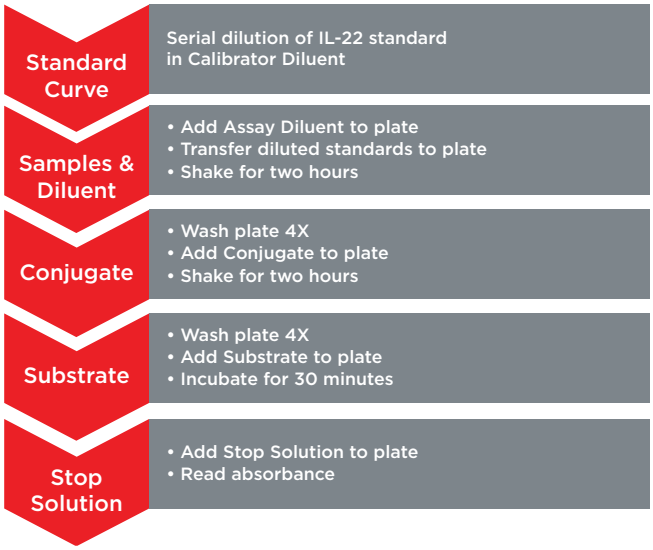

Figure 1. IL-22 ELISA Workflow

Biomek i5 instruments have a high density deck that can accommodate enough labware to use fresh tips for each transfer (Figure 2B) but still retains the flexibility to integrate devices useful for ELISAs such as shakers, plate washers, and plate readers. A Biomek i5 instrument was used to generate serial dilutions of an IL-22 standard and plate triplicate wells for the standard curve. Shaking incubations were performed on an on-deck orbital shaker. The ability to finely control liquid transfers allowed us to fully remove all samples, reagents, and washes from the wells in the absence of a plate washer. Following the aspiration of the bulk 300 µL/well, small volumes were aspirated at 4 points around the edge of the flat-bottom wells to ensure no significant liquid was left behind. This automates a step that typically involves inverting the plate and blotting it to absorbent pads.

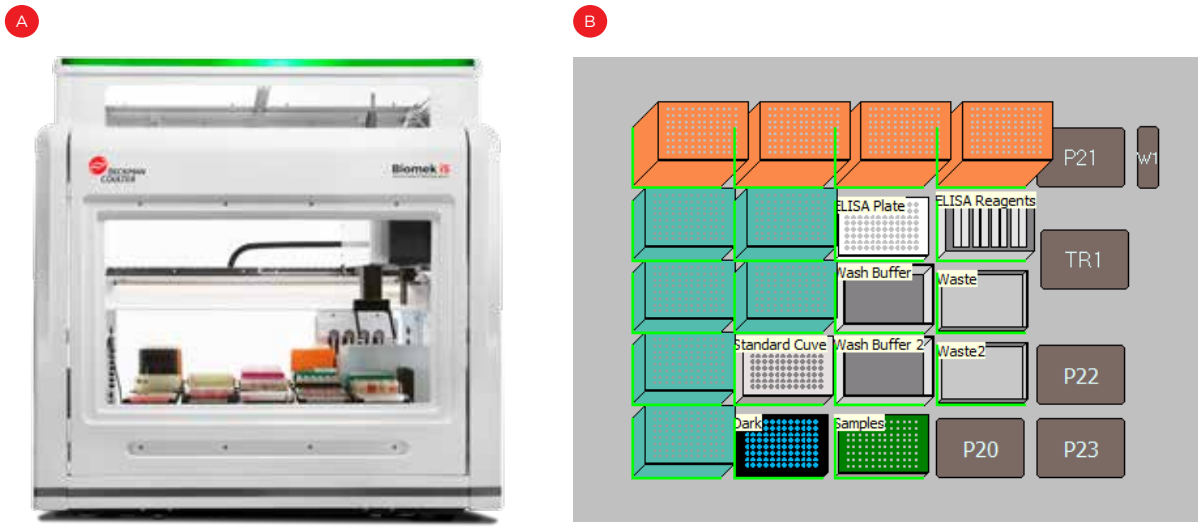

Figure 2. A Biomek i5 Span-8 instrument (A) and one potential deck layout for an ELISA workflow (B).

Table 1 shows the consistency across triplicate values with all CVs below 5%. This reflects the ability of the Biomek i5 instrument to uniformly process samples across a plate. Figure 3 shows the resulting standard curve with a linearity of 0.991, illustrating the excellent performance of the standard curve dilutions.

µg/mL IL-22	Avg. Absorbance	CV
1000	2.568	4.1%
500	1.539	0.4%
250	0.820	2.3%
125	0.441	2.2%
62.5	0.236	2.4%
31.25	0.137	1.1%
15.625	0.089	4.1%
0	0.043	4.9%

Table 1. ELISA standard curve consistency

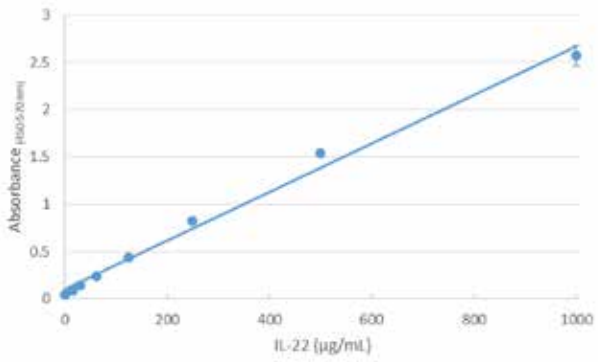

Figure 3. Automated ELISA Standard Curve. Linearity of 0.991 indicates consistent serial dilution and reliable sample preparation. Error bars show standard deviations of triplicates.

These data illustrate the excellent consistency that can be achieved through automation of ELISA assays on the Biomek i5 Span-8 Instrument. While we have only demonstrated the 24 samples of a standard curve, one could process an entire 96-well plate in under 6.5 hours, largely due to the 4.5 hours of incubations. For higher throughput, such as would be required when screening antibody-expressing clones, one could take incubations offline or utilize a Biomek i-Series Automated Workstation with a Multichannel head that can transfer volumes up to 1 mL in a single transfer and thereby accelerate the numerous washes by using the multidispense function. Integrating additional labware storage and/or a plate reader can further increase throughput and reduce interactions with the system to minimize the opportunity for error and provides additional walk-away time for the scientist.

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AAG-2152APP11.16