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S C I E N T I F I C

Design and innovation

Use of Finnpipette Novus Electronic Pipettes for accurate and efficient preparation of standard curves

Introduction

Accurate preparation and measurement of a standard curve is essential for the precise determination of analyte concentration. Because preparing standard curves is a daily routine in many biology and chemistry laboratories, pipette selection for this task is critical.

Examples of applications requiring standard curves

• Total protein determinations

• DNA determinations

• Glucose assays

• ELISA assays

• Enzymatic assays

This application note discusses the use of a Thermo Scientific™ Finnpipette™ Novus™ Electronic Pipette for the preparation of standard curves. With 10 different functions, the versatile Novus Electronic pipette can perform most every standard curve required. The pipette's performance was compared to a manual Thermo Scientific™ Finnpipette™ model to determine if there were appreciable differences in pipetting speed and accuracy during curve preparation.

Materials and methods

1. Finnpipette Novus Electronic Pipettes (30–300)
   (Cat. No. 46200500)

2. Finnpipette Pipette (0.5–5 ml)
   (Cat. No. 4600110)

3. Thermo Scientific™ Finntip™ Pipette tips (300 µl, 5 ml) (Cat. Nos. 94060510 and 9402070, respectively)

4. Test Tubes

5. Black 96-well Thermo Scientific™ Microtiter™ Microplates
   (Cat. No. 9502867)

6. Bovine Serum Albumin
   (Sigma- Aldrich®, A7030)

7. Dulbecco's Phosphate Buffered Saline (Sigma-Aldrich, D1408)

8. Thermo Scientific™ Fluoraldehyde o-Phthalaldehyde Reagent Solution (OPA™, 0026025)

9. Thermo Scientific™ Varioskan™ Multimode Microplate Reader
   (Cat. No. 5250000)

Testing was conducted using a 5 ml Novus Electronic Pipette and a 5 ml Finnpipette manual pipette. BSA dilutions ranging from 12.5 to 100 µg/ml were prepared with both pipettes.

Testing with the Novus pipette was conducted in two different ways. First, curves were prepared using the "Forward" (standard) pipetting function, then curves were prepared using the "Dilution & Mix" function with the pipetting speed set at "7" for both aspiration and dispensing.

The "Dilution & Mix" mode enables selected volumes of two liquids to be dispensed and mixed. After taking up the diluting buffer, an air buffer is aspirated before taking up the sample into the same pipette tip. The trigger button is then pressed and held, causing the pipette to "mix" (repeatedly aspirate and dispense) 70% of the selected volume.

The time required to prepare each dilution series was recorded (Fig. 3). The protein concentration was determined with the OPA-solution that allows for fast quantitation of protein or peptide in solution. This solution reacts with primary amino acids, resulting in highly fluorescent isoindole derivatives.

100 µl of the BSA dilutions was pipetted as three replicates into black Microtiter microplates, then 100 µl of OPA solution was added. The microplates were centrifuged at 2,000 rpm for 2 minutes. Fluorescence was measured using the Varioskan multimode microplate reader. Standard curves were prepared on three different days to verify repeatability.

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Linear lines were used to connect the measurement points, then R2- values were calculated. An R2-value is a measure of the exactness of the linear regression; "1" represents a perfect fit between the data and the line connecting them, while "0" represents no statistical correlation between the data and the line.

Results

The BSA standard curves prepared with a Novus electronic pipette and those prepared with a Finnpipette manual pipette are shown in Figures 1 and 2, respectively. The standard curves prepared with the electronic pipette using the forward pipetting function were similar to those prepared with the Dilute and Mix mode. While the R2-values for all standard curves were > 0.99, indicating a good correlation between the measurement points to a linear line, the curves prepared with the Novus electronic pipette were more convergent than those prepared with the manual pipette.

The time required to prepare the dilution series ranged from 4.5 to 6.5 minutes (Fig. 3). The Novus electronic pipette was 20–30% faster than the manual pipette, an advantage especially important when using sensitive analytes that can degrade or oxidize when dispensed slowly. The Novus electronic pipette's Dilute and Mix mode enabled faster preparation of standard curves and also resulted in a more efficient workflow. The need for a vortexer was eliminated, which reduces the risk of repetitive strain injuries (RSI).

Conclusion

The versatile Finnpipette Novus Electronic Pipette was shown to be an excellent tool for the preparation of standard curves. The electronic pipette demonstrated the ability to perform more accurate curves in 20–30% less time than with a manual pipette. Curve accuracy was due in part to the electronic pipette's index finger operation, which helps to maintain optimal pipette positioning, and its motorized piston movement, which ensures constant pipetting speed.
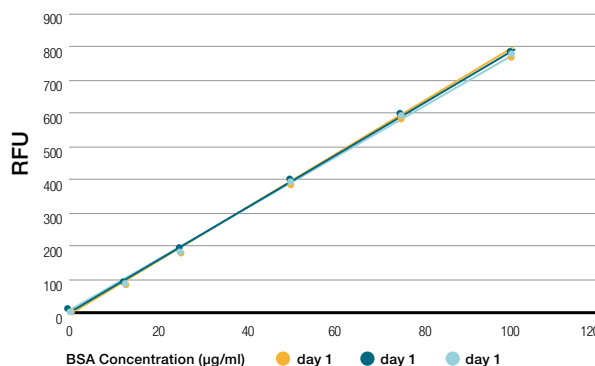

Figure 1. BSA standard curves prepared on three different days with a Finnpipette Novus Electronic Pipette using the Dilute and Mix mode.
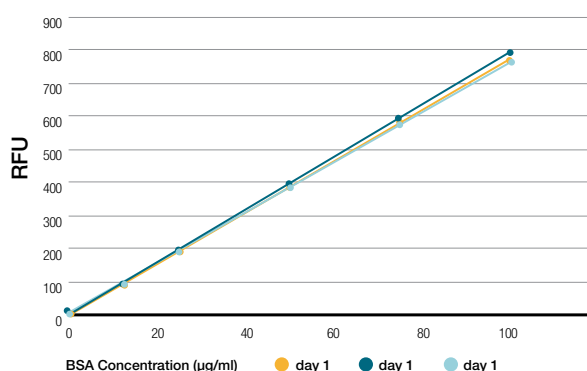

Figure 2. BSA standard curves prepared on three different days with a manual Finnpipette using the forward pipetting technique.
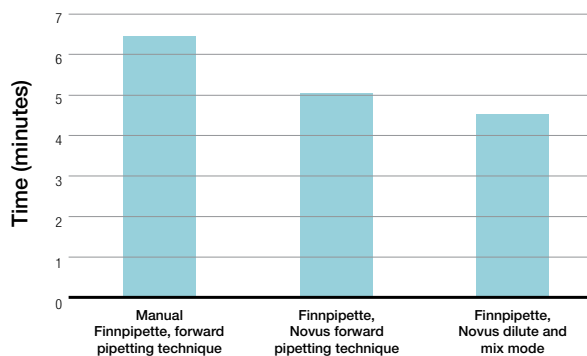

Figure 3. Time required to prepare a dilution series with a manual Finnpipette and a Novus electronic pipette using different modes.

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