

Serial Dilution Performance on the Thermo Scientific Matrix® PlateMate® 2x3

Magdalene Laszczak and Brian Hewson
Thermo Fisher Scientific, 22 Friars Drive, Hudson, NH 03051 USA

Abstract

This experiment was conducted to test the capabilities of the Thermo Scientific Matrix PlateMate 2x3 used for performing serial dilutions in comparison with a manual handheld pipette. The Matrix PlateMate 2x3 is a versatile six-position automated liquid handling platform that allows users to run serial dilutions in row- and column-wise format, eliminating the need to complete them with a manual pipette which can cause strain for the user. The six-position, flexible deck configuration accommodates microplates, reservoirs and tube racks along with tip wash stations and other accessory options. The Matrix PlateMate 2x3 was used with an 8-channel column format serial dilution magazine to perform a 3:2 serial dilution across a 96-well microplate.

Introduction

Serial dilutions are included in many laboratory procedures and vary between dilutions of reagents, compounds or cells. Serial dilutions can be tedious and time consuming for a person to complete using a manual pipette. These protocols can be completed faster with minimal user intervention with an automated liquid handler such as the Matrix PlateMate 2x3 that has serial dilution capabilities. In handheld pipetting serial dilution protocols, errors can occur with each sequential serial dilution step between columns. These transfer inaccuracies lead to less accurate and less precise dispensing. Utilizing automated liquid handler for these serial dilutions will ensure efficiency and accuracy and will eliminate the need for a person to pipette the plates by hand. The repetitive pipetting in serial dilutions can increase the risk of injuries and

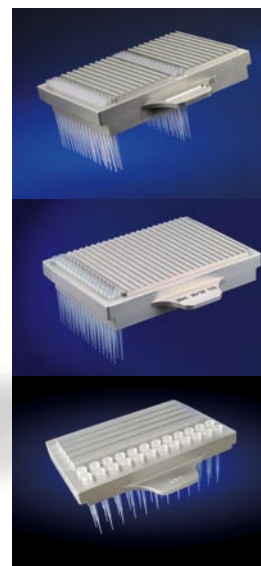


Figure 1:
The Matrix PlateMate 2x3 and serial dilution magazines.

stress factors associated with pipetting ergonomics. The Matrix PlateMate 2x3 can give users the ability to walk away from their serial dilution plates and be ensured they are getting accurate results across the plate. The serial dilution magazines offered by Thermo Scientific are both row- and column-wise formats and are compatible with all Thermo Scientific Matrix D.A.R.T.s® (Disposable Automated Research Tips) tips. Unlike conventional automation tips, Matrix D.A.R.T.s tips use a unique surface sealing technology in which the tips are sealed against a silicone pad on the underside of the pipetting head. This sealing mechanism minimizes tip-to-tip height variations enabling consistent dispensing into the bottom of microplate wells.

The Matrix PlateMate 2x3 is compatible with a total of four user-

interchangeable Air Displacement pipetting heads available to use for serial dilutions. These pipetting heads utilize Matrix D.A.R.T.s tips and cover volume ranges of 0.5-30 µl or 5.0-300 µl in 96-channel configuration and 0.5-30 µl or 1.0-100 µl in 384-channel configuration. These pipetting heads are ideal for applications requiring disposable tips, serial dilutions or high aspiration volumes.

The intuitive graphical ControlMate software allows users to quickly set up and run serial dilutions with the same optimization techniques utilized at the bench. One of the most important steps in a serial dilution is the mixing step and ensuring the aspirate step is at the bottom of the well and dispense at the top. ControlMate software allows the user to improve his or her mix cycle by choosing the amount of mix

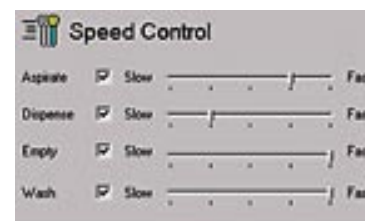


Figure 2: Mix and Speed Control ControlMate software commands.

Key Words

- Thermo Scientific Matrix PlateMate
- Serial Dilution
- Automated Pipetting

cycles and the appropriate heights for the aspirate and dispense. There are also speed control settings that can be implemented at different steps in the serial dilution protocol to slow down the pipetting speeds if required for a specific liquid. ControlMate also gives users the ability to create different liquid classes, which allows the operator to calibrate the instrument for that specific liquid.

Materials:

1. 1.35% Egg Shade Dye Solution (FD&C Yellow #5 and FD&C Red #40)
2. Thermo Scientific Matrix PlateMate 2x3 (Item no. 801-10001)
3. 300 µl Extended Length Thermo Scientific Matrix D.A.R.T.s Tips (Item no. 5536)
4. Thermo Scientific Matrix 96-Well Polypropylene Microplate, Clear, U Bottom, Sterile (Item no. 4918)
5. Thermo Scientific Matrix 384-Well Polystyrene Microplate, Clear, Flat Bottom (Item no. 4310)
6. Thermo Scientific Matrix Serial Dilution Magazine (Item no. 501-30020)
7. Thermo Scientific Matrix WellMate® (Item no. 201-10001)
8. Plate Shaker
9. Tecan Genios Reader
10. Centrifuge
11. ControlMate Software Version Matrix PlateMate 2xY Pre-Release 1.1.15
12. Thermo Scientific Matrix 1250 µl Filtered Pipette Tips, Sterile (Item no. 8045)
13. Thermo Scientific Matrix Single Channel Electronic Pipette, 15-1250 µl (Item no. 1024)

Methods:

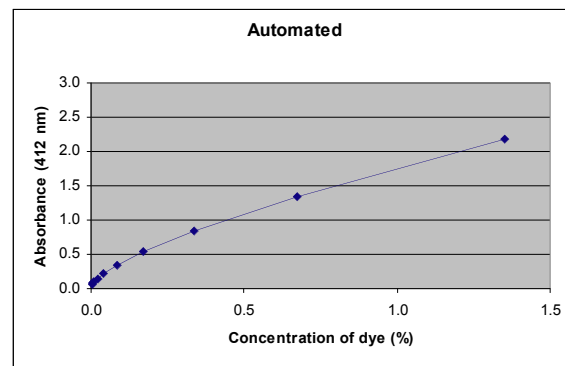
The Matrix PlateMate 2x3 was programmed via Controlmate PlateMate 2xY Pre-Release Version 1.1.15.

1. Using a Matrix WellMate, 115 µl of diH₂O was added to each plate, with column 1 left empty for the addition of dye
2. With a Matrix handheld pipette, the first column was filled with 200 µl of 1.35% egg dye
3. The serial dilution magazine was loaded with a column of tips and the 96-well plate was placed on the deck of the Matrix PlateMate 2x3
4. Using the Matrix PlateMate 2x3 and ControlMate software, the serial dilution was initiated. Starting from column 1, 165 µl of dye was aspirated and dispensed into each consecutive column across the plate and mixed 3 cycles with 190 µl
5. A comparison plate was prepared with the same procedure using a manual pipette
6. Once the serial dilution was completed, the plates were then shaken on a plate shaker at setting 6 for 5 min.

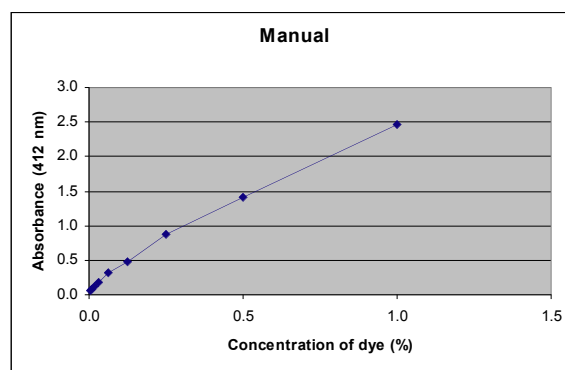
7. The plates were centrifuged at 1750 rpm for 1 min.
8. The plates were scanned using a Tecan Genios Reader set to 412 nm at 5 flashes

Results:

The performance of the Matrix PlateMate 2x3 was tested for serial dilution protocols using a 96-channel (5-300 µl) Air Displacement head and a single column of tips. The Matrix PlateMate 2x3 was fitted with an 8-channel serial dilution magazine using 300 µl Matrix D.A.R.T.s tips.



Graph 1: Matrix PlateMate 2x3 Serial Dilution Plate



Graph 2: Manual Serial Dilution Plate

The general relationship seen in both the automated and manual serial dilution runs is the absorbance value for the dye decreased by approximately one-third with each dilution performed. Serial dilutions currently performed using handheld pipettes can be faithfully duplicated using this automated procedure.

Conclusion:

Based on the results demonstrated above, the Matrix PlateMate 2x3 is able to automate serial dilutions and provide accurate results. The Matrix PlateMate 2x3 gives users the ability to automate their serial dilutions and eliminate ergonomic risk factors of completing them with a manual pipette. The Matrix PlateMate 2x3 has the potential to reduce variability due to the analyst as well as reducing time required to produce duplicate plates. The flexibility of the Matrix PlateMate 2x3 allows users to complete 96/384 plate transfers and serial dilutions in row and column format.

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In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

North America

+1 800 345 0206

matrix.info@thermofisher.com

Europe

+44 (0) 161 486 2110

matrix.eu.info@thermofisher.com

Asia

matrix.ap.info@thermofisher.com

www.thermo.com/matrix

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