The E1-ClipTip Equalizer electronic pipette and Multidrop Combi Reagent Dispensers help improve the efficiency of preparing samples for RT-PCR

Key Words: E1-ClipTip, Multidrop Combi, RT-PCR, throughput, nucleic acid isolation, dispensers, multichannel pipette

Abstract

This study demonstrates improved efficiency using the Thermo Scientific™ E1-ClipTip™ Equalizer expandable-spacing electronic pipette and the Thermo Scientific™ Multidrop™ Combi Reagent Dispenser in preparing samples for RT-PCR. The results show a 63% reduction in the amount of time required to prepare samples for nucleic acid extraction when using the E1-ClipTip Multichannel Equalizer pipette and the Multidrop Combi Reagent Dispenser. This time reduction also enables as much as a 24% increase in throughput by reducing instrument idle time between RT-PCR runs.

Background

One of the challenges in preparing samples for RT-PCR is the manually intensive, error-prone and inconsistent sample transfer step before nucleic acid isolation. In most cases, prior to nucleic extraction, samples must be transferred from one vessel, such as sample tubes, to a completely different configuration such as the more commonly used 96-well sample plate. This can be very cumbersome. The **E1-ClipTip Multichannel Equalizer** is an electronic pipette with adjustable tip spacing that allows users to quickly and efficiently transfer samples between various vessels including tubes, racks, microplates, a horizontal gel box, etc. replacing the otherwise labor-intensive and time-consuming process using a single-channel pipette.

During nucleic acid extraction, there are multiple wash steps and an elution step that require 96-well plates to be filled with the appropriate solutions. Lastly, the isolated nucleic acid must then be transferred to a PCR plate and combined with the RT-PCR reagents. To help alleviate time and effort in these steps, the **Multidrop Combi Reagent Dispensers** can be used to swiftly and accurately fill the wash and elution plates required for the nucleic acid isolation process and the E1-ClipTip Multichannel Equalizer pipette can be used to combine the sample and necessary reagents for RT-PCR.

Generally, preparation for RT-PCR requires numerous manual pipetting steps that not only increase the risk of repetitive stress injuries but also significantly contribute to the inefficiencies and errors that impact the throughput and performance of the RT-PCR workflow. Used together, an E1-ClipTip Multichannel Equalizer pipette and Multidrop Combi Reagent Dispenser can save significant time during preparation of samples for RT-PCR.

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Materials and methods

In order to determine the amount of time saved during all the liquid transfer steps needed prior to RT-PCR, a technician was timed using manual pipetting versus using the E1-ClipTip Multichannel Equalizer electronic pipette and a Multidrop Combi Reagent Dispenser. To ensure that only liquid transfer steps were measured, all reagents and equipment were ready for use. The protocol for the **Thermo Scientific™ MagMAX™ Viral/Pathogen Nucleic Acid Isolation Kit (Cat. No. A48310)** was followed. First, the technician prepared the processing plates (Table 1) using either an 8-channel manual pipette or the Multidrop Combi Reagent Dispenser (one Multidrop Combi Reagent Dispenser per solution). Next, the technician prepared the 96-well sample plate by adding the reagents for nucleic acid isolation using an 8-channel E1-ClipTip Equalizer electronic pipette (Table 2). Lastly, the technician prepared the plates for RT- PCR (Table 3) and the time required was recorded.

Table 1: Preparation of the nucleic acid isolation processing plates

Plate ID	Plate type	Volume per well	Device
Wash plate 1	96 deep-well plate	1,000 µL	8-channel pipette or Multidrop Combi
Wash plate 2		1,000 µL	
Wash plate 3		500 µL	
Elution plate		50 µL	

Table 2: Steps used to prepare plates for nucleic acid isolation

Step	Volume	Device
1. Add Proteinase K (96 wells)	10 µL	8-channel pipette or 8-channel E1-ClipTip Equalizer pipette
2. Add negative control (1 well)	400 µL	Single-channel pipette
3. Add sample for extraction (94 wells)	400 µL	Single-channel pipette or 8-channel E1-ClipTip Equalizer pipette
4. Add bead binding mix (96 wells)	550 µL	8-channel pipette or 8-channel E1-ClipTip Equalizer pipette
5. Add positive control (1 well)	10 µL	8-channel E1-ClipTip Equalizer pipette

Table 3: Steps used to prepare 96-well PCR plate for RT-PCR

Step	Volume	Device
1. Preparation of positive control and reaction mix	Various	Single-channel pipette
2. Add reaction mix to PCR plate (96 wells)	20 µL	8-channel pipette or 8-channel E1-ClipTip Equalizer pipette
3. Add nucleic acid samples to PCR plate (94 wells)	5 µL	
4. Add positive control (1 well)	2 µL	Single-channel pipette
5. Dilute positive control with nuclease-free water (1 well)	3 µL	
6. Add negative control (1 well)	5 µL	

Results and conclusions

The results of this study show that there is a 63% reduction in hands-on time required for preparation of samples for RT-PCR using an 8-channel E1-ClipTip Equalizer pipette and Multidrop Combi Reagent Dispensers compared to performing these steps manually (Figure 1). The amount of time it took to prepare the samples and plates for nucleic acid extraction manually took 45 minutes compared to 16 minutes using the 8-channel E1-ClipTip Equalizer pipette and Multidrop Combi Reagent Dispensers. The preparation of the 96-well plate for RT-PCR went from 30 minutes to 12 minutes using the 8-channel E1-ClipTip Equalizer pipette. Taken together, the total time savings is 47 minutes (75 minutes – 28 minutes). This cuts the time it takes for manual pipetting by more than half and is also more ergonomic-friendly because of the reduced number of pipetting steps. A substantial number of these pipetting steps are eliminated by using the 8-channel E1-ClipTip Equalizer pipette to transfer the 94 samples from their collection tube to the 96-well plate by utilizing its adjustable tip spacing.

The greatest impact on the RT-PCR workflow is the overall reduction in PCR instrument downtime as the devices wait for plates to be prepared. This time savings results in a 24% increase in sample throughput for a standard RT-PCR workflow (Figure 1). This also allows two PCR instruments to run continuously and increases the number of samples that can be processed in 24 hours from 30 plates (2,820 samples) to 37 plates (3,478 samples).

Furthermore, performing the liquid handling steps can be much faster and more consistent using an electronic pipette that includes step-by-step program creation versus having to change volumes with manual pipettes. E1-ClipTip has the ability to import protocols created in the My Pipette Creator App available on **Connect**. Protocols can also be shared between users and labs using the app. This reduces pipetting errors and maintains reproducibility across operators and labs.

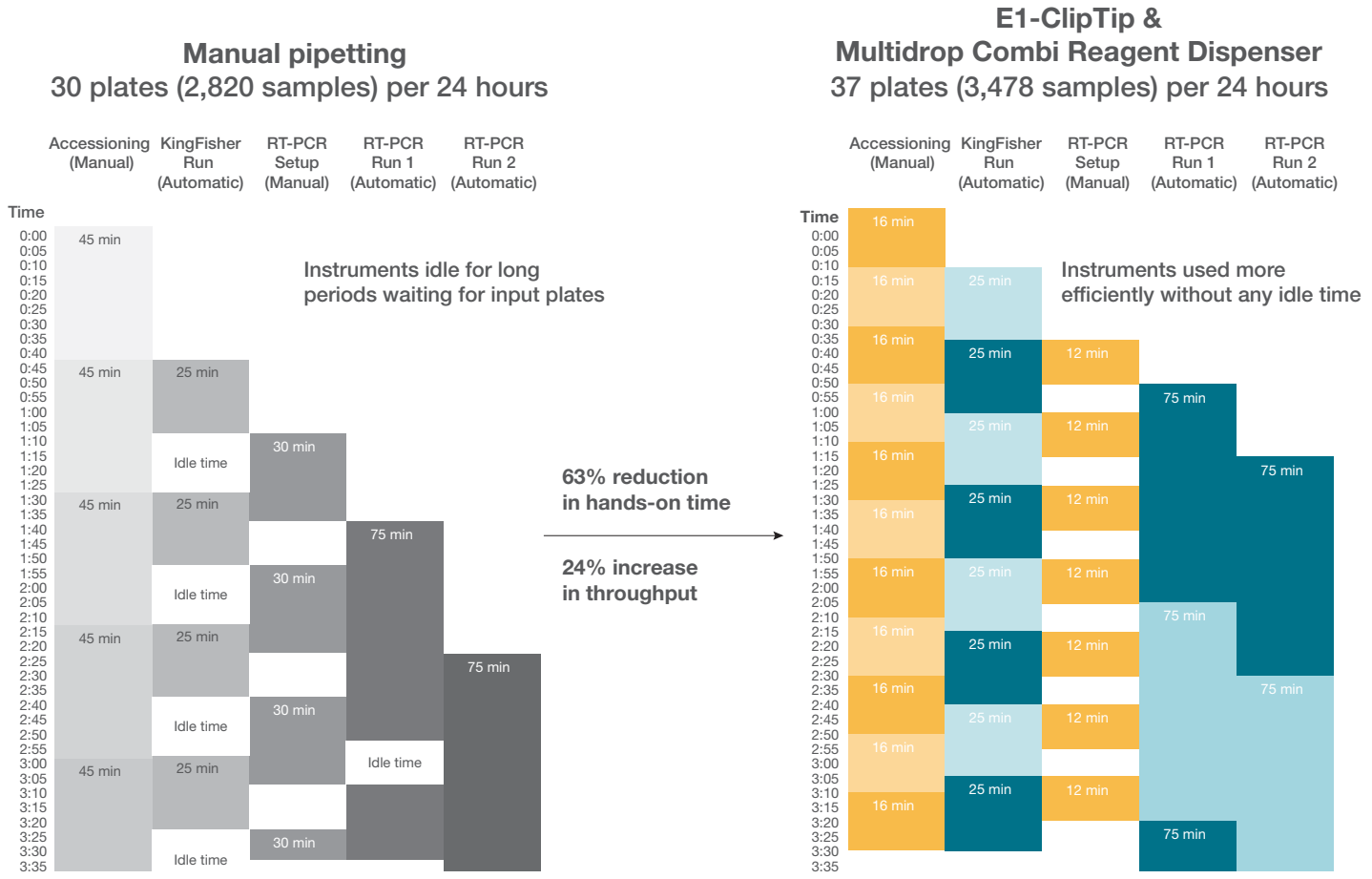

Figure 1: Increased RT-PCR throughput by 24% and 63% reduction in hands-on time using E1-ClipTip Equalizer and Multidrop Combi Reagent Dispenser.

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Summary

- The **E1-ClipTip Multichannel Equalizer pipette** saves time by allowing users to perform multiple sample transfers simultaneously between virtually any tube, rack, microplate or horizontal gel box quickly and efficiently by simply sliding the scale to expand or contract the distance between tips to the desired labware.
- The **Multidrop Combi Reagent Dispensers** provides accurate automated dispensing allowing high-throughput filling of plates with any well size.
- A 63% reduction in the amount of time required to perform nucleic acid extraction preparation steps was determined with the use of the 8-channel E1-ClipTip Equalizer pipette and Multidrop Combi Reagent Dispenser. This time reduction enables as much as a 24% increase in throughput by reducing instrument idle time between RT-PCR runs.

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