A Comparison of Thermal Cycler Efficiency

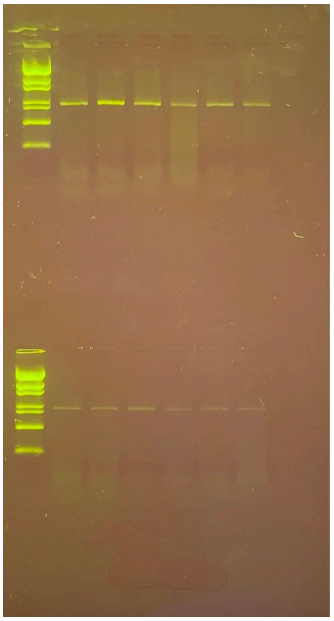
Amelia Technologies, LLC
1121 5th Street NW
Washington, DC 20001 USA
info@ameliatechnologies.com
www.amelia-technologies.com

The Polymerase Chain Reaction (PCR) is a biotechnology technique that allows researchers to quickly create millions to billions of copies of a specific region of DNA *in vitro*. Because of its ease of use and its ability to rapidly amplify DNA, PCR has become indispensable in the medical and life sciences lab. Like many labs, we have several PCR thermal cyclers from different manufacturers that we use interchangeably. We decided to assess the efficiency of our PCR experiments to ensure that all units performed equivalently when performing our experiments.

Assessment of Amplification Efficiency

We assessed the performance of three thermal cyclers: The ProFlex™ Base with the 96 well block installed (Applied Biosystems® | Thermo Fisher Scientific), the EdvoCycler™ 2 (Edvotek®) and the EdvoCycler™ Jr (Edvotek®). Genomic DNA was extracted from immortalized mammalian cells using Epicentre™ QuickExtract™ DNA Extraction Solution. Two-fold serial dilution of the extracted DNA was performed before setting up the samples. 30 cycles of PCR amplification were performed using AmpliTaq Gold™ 360 Master Mix and 200 µM gene-specific primers. Samples were analyzed using a 2.0% TBE gel run at 100 V for 45 min and visualized with SYBR® Safe DNA Stain. Equivalent samples were run next to one another for direct comparison.

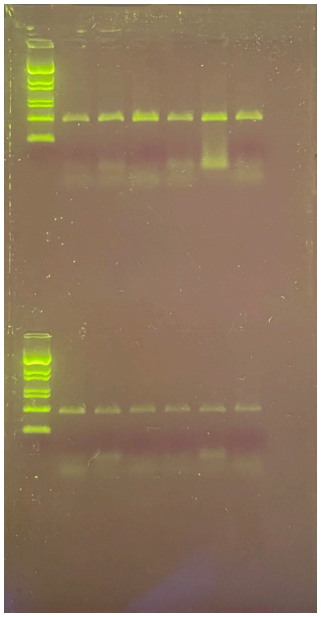
After performing electrophoresis, the signal intensity from the PCR product from the three thermal cyclers at each dilution was comparable. Based on our results, we conclude that all three thermal cyclers performed well and produced equivalent results.



DNA Repair Gene: Primer Set 1

Top:
Lane 1: Standard DNA Ladder
Lane 2: EdvoCycler Jr Undiluted DNA
Lane 3: EdvoCycler 2 Undiluted DNA
Lane 4: ProFlex Undiluted DNA
Lane 5: EdvoCycler Jr 1:2 Diluted DNA
Lane 6: EdvoCycler 2 1:2 Diluted DNA
Lane 7: ProFlex 1:2 Diluted DNA
Lane 8: empty

Bottom:
Lane 1: Standard DNA Ladder
Lane 2: EdvoCycler Jr 1:4 Diluted DNA
Lane 3: EdvoCycler 2 1:4 Diluted DNA
Lane 4: ProFlex 1:4 Diluted DNA, primer X2
Lane 5: EdvoCycler Jr 1:8 Diluted DNA, primer X2
Lane 6: EdvoCycler 2 1:8 Diluted DNA, primer X2
Lane 7: ProFlex 1:8 Diluted DNA, primer X2
Lane 8: empty



DNA Repair Gene: Primer Set 2

Top:
Lane 1: Standard DNA Ladder
Lane 2: EdvoCycler Jr Undiluted DNA
Lane 3: EdvoCycler 2 Undiluted DNA
Lane 4: ProFlex Undiluted DNA
Lane 5: EdvoCycler Jr 1:2 Diluted DNA
Lane 6: EdvoCycler 2 1:2 Diluted DNA
Lane 7: ProFlex 1:2 Diluted DNA
Lane 8: empty

Bottom:
Lane 1: Standard DNA Ladder
Lane 2: EdvoCycler Jr 1:4 Diluted DNA
Lane 3: EdvoCycler 2 1:4 Diluted DNA
Lane 4: ProFlex 1:4 Diluted DNA, primer X2
Lane 5: EdvoCycler Jr 1:8 Diluted DNA, primer X2
Lane 6: EdvoCycler 2 1:8 Diluted DNA, primer X2
Lane 7: ProFlex 1:8 Diluted DNA, primer X2
Lane 8: empty

Furthermore, we also found that the times to run the experiments were within 5% of one another, demonstrating that both the heating and cooling ramp rates for the thermal cyclers were similar (Table 1). This is important when considering reproducibility across units, as poor temperature control can result in the amplification of non-specific products[1]. It should be noted that all three units use Peltier cells for active heating and cooling of the sample block for speed and uniformity of the temperature changes. Many budget machines do not have active cooling, which can affect the experimental results and the time to complete the full PCR program.

Table 1: Time for PCR Program Completion.

	EdvoCycler™ Jr	EdvoCycler™ 2	ProFlex™ PCR
time:	1:43:30	1:40:22	1:36:23

1. Kim, Y.H., et. al. "Performance evaluation of thermal cyclers for PCR in a rapid cycling condition." BioTechniques. Volume 44, Issue 4, April 2008, pp 495-505.