MULTIPLEX PCR ON A PET MICROFLUIDIC CHIP ON A PORTABLE SPINNING DEVICE

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Rapid DNA analysis systems have been developed over the past decade to provide forensic-quality short tandem repeat (STR) profiles for human identification (hID). While these systems have exploited polymeric materials (COP or PMMA) that can be injection-molded or machined to obtain the necessary microfluidic architecture, prototyping is slow and the fabrication costly. Additionally, devices used to run those analyses are expensive and require complicated external hardware (active valves, air pump, air syringes) to control fluid flow. Here, we demonstrate a portable spinning polyester-toner (PeT) microfluidic device capable of mixing PCR reagents and PCR-ready DNA to perform rapid PCR on a miniaturized platform. The chips are composed of a commercially-available transparency film and that, combined with the ease of fabrication [1], makes the PeT microfluidic chips cost-effective ($0.20 USD and <10 min fabrication time) and amenable to single use disposability. With minimal passivation required to enhance the amplification efficiency, we demonstrate the genetration of full profiles via chip-based STR amplification in less than 30 minutes. This represents a paradigm shift in both the consumable (chip) and the external hardware (rotationally-driven) potentially providing a new platform to the forensic microfluidic DNA analysis community.

1. Thompson, B.L., Ouyang, O., Duarte, G.R.M., Krauss, S.T. and Landers, J.P. Inexpensive, rapid prototyping of microfluidic devices using overhead transparencies and a laser print, cut and laminate fabrication method. *Nat. Protoc*. 10(6):875-86, 2015.