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SPIN PREP- Sample Prep Automation for Next Generation Sequencing

A portable, low-cost instrument and consumables with a target market of low-to-medium throughput NGS users

Reference: SPIN PREP

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Seeking

University spin out, Commercial partner, Development partner

About **Dublin City University**

Dublin City University (DCU) aims to transform lives and societies through education, research and innovation. Research and Innovation at DCU stems from the academic excellence of its four faculties coupled with a passion for translating knowledge into innovations for economic or societal benefit.

Background

Nucleic acid library preparation is a critical part of sample preparation for next-generation sequencing (NGS), as well as for many other applications. Low-to-medium throughput (500-15,000 sample preps/year) customers in this area are Biopharma labs, Hospital Labs, Academic and Research PIs, Sequencing Cores and Service providers pursuing both research and clinical applications of NGS.

There are tens of thousands of decentralised laboratories in companies, hospitals, research facilities and other point-of-use environments with low-to-medium throughput requirements. These labs need a more reliable, cost-effective and time efficient solution for implementing DNA library preparation protocols using SPRI. Current approaches include:

- Manual processing using pre-defined steps in kits, which is highly labour-intensive and error-prone;
- Robotic systems that automate handling of the kits on a large scale, which are very expensive (>USD200K) and wasteful in reagent usage for smaller throughputs;

Microfluidic products launched by NuGen (Mondrian) and Illumina (Neoprep) were withdrawn due to significant reliability issues, leaving a major gap in servicing the market for low-to-medium throughput applications. The current competition in this space (Voltrax from Oxford Nanopore and Miroculus) use the same technology as the failed Neoprep. Our market research has identified a significant commercial opportunity for a product that performs DNA library preparation including clean-up and size selection using the SPRI technology for low-tomedium throughput applications.

Tech Overview

The Microsystems and Bio-interfacing group led by Dr. Rohit Mishra at the Fraunhofer Project Centre for Embedded BioAnalytical Systems at Dublin City University (FPC@DCU) is developing a microfluidic solution to automate library preparation. This technology is used for bead based nucleic acid clean-up and size selection encompassing the enzymatic steps. The system comprises a portable, low-cost instrument and consumables with a target market of low-to-medium throughput NGS users.

Based on its extensive expertise and background IP in microfluidics, the we will develop an affordable, automated, NGS library preparation system, which delivers reproducible, high-quality outputs while minimising reagent use. DCU's patented, event-triggered dissolvable-film (DF) valve technology provides an unparalleled level of robust, multiplexed flow control which enables development of highly integrated, single-use LoaD cartridges for handling samples and reagents. This reduces complexity, footprint and cost of instrumentation, requiring only a spindle motor, temperature control and magnetic particle manipulation. This is a significant advantage over large-scale liquid handling robotics and other microfluidic technologies that employ expensive and error-prone components for pumping and valving. Pursuing a design-for-manufacture and scale-up strategy compatible with industry

standard mass-manufacturing practices, FPC@DCU will deliver early prototypes that can be rapidly replicated for evaluation by early adopter customers.

Benefits

- Automation of bead-based nucleic acid clean-up and size selection encompassing enzymatic end repair, A-tailing and ligation protocols.
- Fluidic control protocol that can be user customised for compatibility with widely used kits and off-the-shelf reagents.
- Minimal sample and reagent wastage while reducing inter-prep variation, leading to high reproducibility compared to manual handling for low-to-medium throughput demands.
- Competitive cost per library prep at lower sample throughput requirements due to simple LoaD instrumentation (Device cost EUR 10K, Consumable cost per prep EUR 5).
- Small footprint and seamless integration into current manual laboratory work flows by allowing the user to pipette samples and reagents into the disc cartridge and pipette out the prepared DNA solution to the next step

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