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A high throughput, inexpensive and open-source bioreactor for optimization of recombinant protein expression

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Automation allied to a miniaturized and high throughput format for protein production allows researchers to conduct high complexity experiments for screening expression conditions as it handles a number of different samples simultaneously. For structural biology studies, establishing the conditions for obtaining large amounts of correctly folded protein is still a time consuming process. Although various methods are available nowadays, the equipment required for small volume-parallel processing of expression conditions is expensive and isolated to facilities where it must be operated by trained personal. In this context, the development of open-source hardware/software tools applied to biotechnology can improve research conditions at low-cost and with relatively uncomplicated approaches. This study will report an inexpensive customizable device for high throughput protein expression making use of 3D printing techniques and open-source software/hardware.(1) The prototype developed will be capable of monitoring and adjusting bacterial culture conditions such as temperature, pH, oxygenation, and cell growth (A600) of a customized number of small volume samples.(2) The programmed addition of reactants will be performed by the device, providing the user with an option to slightly change the original experiment's setup. All the features will be controlled by an Arduino Mega board (Atmega2560 microcontroller), programmed and monitored using Arduino IDE. Structural components of the device will be modeled on CAD softwares and 3D printed using a RepRap cartesian 3D printer. Assembling automated and customized devices using open-source software/hardware provides the opportunity of using high throughput methods even in small laboratories and, therefore,our findings can greatly facilitate the studies and reduce the costs of projects involving protein expression.

Palavras-chave: Protein expression. Recombinant protein. 3D printing. Free software. RepRap

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