Portable Point of Care Flow Cytometry Using Advanced Magnetohydrodynamic Fluid Transport

Published date: April 26, 2016

Technology description

A method for portable point of care flow cytometry
Flow cytometry is used to analyze cells from patients in order to detect a range of possible signs of problems. Chemotherapy patients in particular must undergo regular, usually weekly, monitoring of their blood cells to check for treatment-induced myelosuppression – the reduction of the number of red and white blood cells due to the effect of chemotherapy. Currently, cell cytometry is preformed using bulky, expensive flow cytometry machines that require expensive reagents and trained technicians.
A new method of preforming cell cytometry has been invented that incorporates several cutting edge technologies. The new invention is small, and therefore portable, and incorporates state of the art lab-on-a-chip (LOAC) technology utilizing magnetohydrodynamic (MHG) forces to move very small amounts of blood or other bio-fluid. The new invention also uses advanced software to do check for abnormal size, shape, or color.
Utilizing the new invention, a patient need not travel to a hospital once a week to give a large blood sample. Instead, the patient can obtain a small amount of blood at home from a finger stick or other method, apply the blood to the LOAC for test by the portable flow cytometry tester (FCT). The FCT uses advanced optical imaging in conjunction with special stains to produce images of the cells in the bio-fluid. The results can be either analyzed at the location of the test, or can be sent to a computer analyzer "in the cloud", and the results sent back to the FCT, and/or the doctor's office. The doctor can then check the results and recommend to the patient any action that may need to be taken.
Technology:
The FCT uses a special new MHD method to move the fluid. MHD uses a combination of an electric current and a magnetic field to create the force that moves the test fluid. A particular result of the new MHD design is that of a flat fluid velocity profile which allows the optics to produce especially sharp images for the FCT. The new MHD solves two problems of other MHD designs in that it does not result in the corroding of the electrodes and does not produce bubbles in the fluid flow that obstruct the flow of the test fluid.
By merging a highly controllable and low-power method of fluid transport to a high-resolution microscopy modality, there is great potential to significantly improve upon current image cytometry platforms in both resolution and throughput. Specifically, coupling these technologies, will enable high

resolution imaging of a focal region up to several millimeters in width, far exceeding the throughput of other single channel methods of cytometry, including most flow cytometry methods. Thus, this technology provides a potentially low-power, portable operation with no complex moving parts suitable to transform across a broad range of biomedical applications.

Application area

The merging of MHD technology to imaging presents an innovative method to expand the role of flow cytometry and imaging cytometry applications to cell biology, enable the use of these methods in educational settings; for example this technology could potentially translate as an image cytometry substitute for under-funded university settings. Also, this tool could significantly amplify the impact of optical imaging devices for point of care diagnostics in low-resource settings.

Advantages

* Low-cost application
* Portability
* No moving parts
* Mutliplex diagnostic applications
* Point of care capability
* Programmable fluidic manipulation.
* High throughput
* Low power
* Platform capable of broad applications in clinical, research, and industrial venues
* Narrow channels are not needed, which simplifies construction and avoids blockage
* Optical sectioning ability to discriminate particles or cells in deep chambers and decrease the number of dilution steps

Institution

University of Arkansas

Inventors

Adair Claycomb
Foysal Khan
Amy Powless
Graduate Research Assistant
BMEG
Joshua Hutchenson

Ingrid Fritsch
Professor
Chemistry and Biochemistry
Christena Nash
Timothy Muldoon
Assistant Professor
Biomedical Engineering

联系我们

叶先生

电 话：021-65679356
手 机：13414935137
邮 箱：yeyingsheng@zf-ym.com