CMC MICROSYSTEMS IMPACT

Personalized and More Effective Cancer Treatment is on the Horizon

Dr. Paul Li, Associate Professor of Chemistry at Simon Fraser University, is collaborating with researchers at the British Columbia (BC) Cancer Agency and CMC Microsystems to combat the increasing resistance to commonly used drugs and to develop more personalized treatments for cancer patients.

"Microfluidic chips are like a lab-on-a-chip, allowing minute volumes of liquids or gases to be tested quickly and easily. These miniature labs can perform tasks such as separating blood cells and analyzing DNA. We are working with an industrial partner on the instrumentation that will make our microfluidic-based system portable. CMC will play a key role as we further develop this technology and prepare for clinical trials."

Dr. Paul Li
Associate Professor, Chemistry
Simon Fraser University

Dr. Paul Li, Associate Professor of Chemistry at Simon Fraser University, is using microfluidics technology to combat the increasing resistance to commonly used drugs and to develop more personalized treatments for cancer patients. ZellChip Technologies Inc, a spinoff from Simon Fraser University, will help to commercialize the technology.

Multi-drug resistance is a major impediment to successful cancer chemotherapy. Many human cancers are either resistant to chemotherapy at the outset or during medical treatment, after which they are no longer affected by commonly used anticancer drugs. Identifying the chemical compounds that will inhibit and then kill drug-resistant cancer cells in different patients is a key objective in cancer research. Leading-edge research in microfluidics at Simon Fraser University (SFU) offers a promising approach to this challenge.

By using a technique called single-cell analysis, pharmaceutical companies may soon be able to offer customized medicines that will kill specific cancer cells in patients. The analysis of individual cells allows researchers to differentiate between a heterogeneous population of cells that have many different attributes. The ability to characterize individual cells (as opposed to an average characteristic found in a group of thousands or millions of cells) is essential to improve our understanding of drug response when treating diseases such as cancer. The implementation of this single-cell analysis technique on a lab-on-a-chip could enable a doctor to assess the characteristics of the patient's cancer cells and determine a customized course of treatment. Microfluidic technology offers the potential to perform this assessment at the patient's bedside prior to treatment.

Single-cell analysis is now recognized as a promising technique to improve chemotherapy treatment. The technology required to bring this technique into commercial application is emerging—thanks to Dr. Li, collaborators from SFU and the BC Cancer Agency. The team has developed a lab-on-a-chip device that analyzes the single cancer cell obtained from a biopsy sample for cellular response and drug retention, and injects an inhibitor to reverse the multi-drug resistance of the cancer cell.

To develop a working prototype and validate his technology, Dr. Li relied on products and services offered by CMC. "This initial prototype, developed through CMC, delivers the drug to the cell and measures cellular response. Without this technology, I would not have been able to prototype a chip capable of retaining a single biological cell. This research is essential to overcoming multi-drug resistance." *cmc*