



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

Name(s) Vick C. Liu	Project Number S1207
Project Title A Completely Home-Made Microfabricated Device for Blood Cell Sorting and Morphology Analysis	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goals are: 1) to develop a cookie-baking like method to fabricate micro-devices (with feature size of 10 μm) at home; 2) design, fabricate, and test a homemade micro-device for blood cell sorting and morphology analysis.</p> <p>Methods/Materials The micro-device was completely fabricated using household appliances (such as a handheld UV lamp, oven). A simple soft lithography process was developed at home. The channel device (50 μm deep) that contains 10~30 μm pore structures to fractionate various blood cells based on size difference was designed using AutoCAD software and the channel pattern was then printed on a transparency. The pattern was converted from the transparency to a photoresistor (SU-8) using a UV lamp. After development, a SU-8 mold was obtained to replicate PDMS (silicone) microchannels using a baking oven.</p> <p>The devices were tested in a hematology lab with human blood samples. The blood was treated with New Methylene Blue before loading into the device. A microscope was used to obtain cell images.</p> <p>Results The microchannel devices with 10-30 μm pore size microstructures were successfully fabricated at home using a cookie-making method. The test with human blood samples showed that the device successfully separated RBCs, WBCs, and plasma into different compartments. It allowed me to see morphology of various blood cells including sickle cells, lymphocytes, neutrophils, eosinophil, etc, some of which are clear indications of a sick person's health status.</p> <p>Conclusions/Discussion Making a micro-device with feature size as small as 10 μm (1/10 of a typical human hair diameter) at home sounds impossible because microfabrication typically requires very expensive and sophisticated industrial equipment. I developed a simple and low cost technique to make this micro-device at home using household appliance. This method allows one to replicate hundreds of micro-devices at a cost of 50 cents each. As a demonstration, I successfully made microchannel devices with filter structures of 10~30 μm for blood cell morphology analysis. The device presents a more practical way of blood cell analysis compared to using blood smears. In addition, the device is reusable, cheap to build, and easy to make.</p>	
Summary Statement My project is about the development of a novel microfabrication method to make home-made microdevices for blood cell sorting and morphology analysis.	
Help Received Used lab equipment for test at Iris Diagnostics under the supervision of Dr. Liu.	