An Automated Microfluidic Platform for Food Safety and Human Allergy Analysis

Hui, Hoi Ian (School: Pui Ching Middle School)
Fong, Chun Hei (School: Pui Ching Middle School)

Type 1 hypersensitivity response such as anaphylaxis due to food substances is a growing problem that affects a huge number of patients globally. The current allergen test, the skin prick test, despite being a well-recognized allergen test, it fails to provide an objective analysis for patients as to whether they will suffer an severe anaphylactic shock or only a rash. Moreover, patients may still consume allergens accidentally despite knowing they are allergic to them. As such, we have established a personalized analytical system by integrating medical diagnostic techniques, cell culture technology on a microfluidic platform combined with chips. The system includes two parts. The first part is the Allergy Immuno Analyzer (AIA), it uses granulocytes (e.g. mast cells) activation test to mimic the patient's cellular response in vitro upon stimulation, mediators (prostaglandin d2, beta hexosaminidase) will be released if the patient is allergic to the stimulus. ELISA and substrate are then used to detect the presence of mediators. The second part is the Allergen Immuno Detector (AID), which utilizes the diagnostic technique of ELISA. After knowing what is the patient allergic to, we will provide her an AID to detect whether there are any particular allergens of hers in food products, preventing her from consuming allergens accidentally. However, the experimental procedure is time-consuming. Therefore we also automated the system through the combination of pumps and a software. In conclusion, our system can save lives by preventing patients from having type 1 hypersensitivity responses.

Awards Won:
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