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Suggested Project Title:
Design a fully automated and rapid analyser for pathogen detection in water based on ultrasound and lab-on-ship technologies.

Suggested Project Summary:
Drinking water is the subject of strict regulations aiming at controlling the existence and virulence of pathogens such as Cryptosporidium responsible of acute diarrhoeas and sometimes deaths in infants and immune-deficient adults. Scotland is particularly prone to such epidemic contamination due to heavy rainfalls on farmlands. Samples taken from water sources, waterworks and rural areas are brought back to central laboratories delaying furthermore the detection of onsets of water pollution. Industrial systems used today are slow, labour intensive and require expensive specialised personnel. Rapid and automatable systems for pathogen detection are highly sought-after.

Currently, the pathogens detection protocol consists of two stages:
The first stage called sample preparation which is the process of concentrating large volume of water (e.g. 1000L) to a very small volume (e.g. few mL). The second stage is the microscopic detection. It begins with further concentration of the sample to a volume used under the microscopes (e.g. few µL). This technique is very costly as the reagents used in the pre-treatment are very expensive and the process takes a long time to deliver the results which are subject to human errors.

This project aims to develop ultrasound solutions to be applied in the first stage and lab-on-ship technology for the second stage of the detection protocol.
A fully automated system is proposed to combine between sample preparation and detection. The system will integrate ultrasound and lab-on-ship technologies to the existing protocol. This will help to improve the recovery rate and the time for processing large volume of water. This technique has a potential commercialisation which can lead to a patent application.

Collaboration Sought for the Project:
We will integrate the various technologies into a cost-effective, user-friendly platform with integrate electronic control boards and user interface. This project will propose solutions for the fluidic interconnection of the different sampling, filtration and detection modules prototyped. Cost-effective solutions will be sought and the use of polymer

material will be maximised by the presence of a polymer chip manufacturer. Additionally, a portfolio of several proven technologies will be considered for integration, which includes capillary based and pneumatic based microfluidic separation and concentration techniques, integrated optical lenses and optoelectronic detectors.

Published or Private?:
Yes