Name of the project: Developing a portable and low-cost device using dynamic light scattering for Rotavirus detection in environmental and drinking water
Category: Environment & Health

Problem Statement:

- 500k children <5 years, and >50k more aged 5-9 die due to diarrhea each year
- 37% of these preventable deaths are due to Rotavirus
- Current detection systems are based on polymerase chain reaction (PCR), genetic sequencing, and SEM, which are expensive, require infrastructure, expensive consumables, highly skilled human resources, and in overall aren't practical for wide-scale deployment in resource-limited settings where they are actually needed.

Proposed Solution: Develop a low-cost, reagent-less, highly portable, Dynamic Light Scattering (DLS) based detection device for rapid detection of rotavirus in water. Pilot experiments with bench-top setup show that we can detect 4000 U/ml live attenuated rotavirus from Rotarix oral vaccine in water.

Features of the target device:

- Should be portable (⌀3cm, length 12cm, <250g), low-cost (~$100 in materials), user-friendly (minimal training required), no reagents required

Real world applications:

- Surveillance of environmental and/or drinking water in resource-limited settings, identify fecal contamination, prevent water-borne diseases transmitted by oral-fecal route

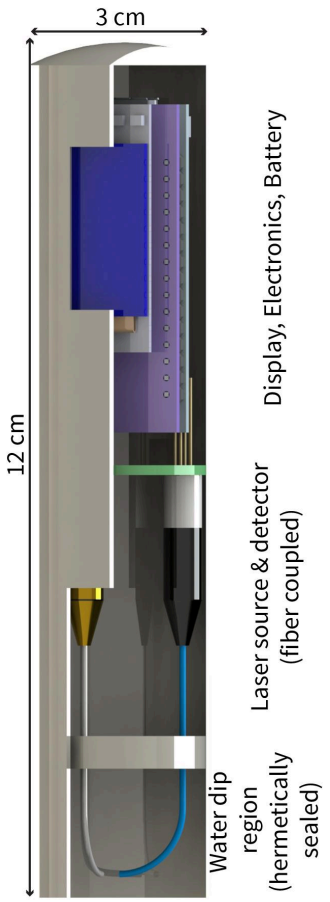

Fig: Design of the proposed system, showing different components

Project outcomes:

- Research, development and related publications in context of using DLS to detect rotavirus particles, focusing on particularly on required sensitivity and specificity
- Understanding of diffusion characteristics of rotavirus particles and their clusters
- Development of a prototype device, reaching alpha testing stage in partnership with local governmental and non-governmental stakeholders in water supply systems
- Foster local research and innovation ecosystem in a developing country, providing research opportunity to solve important global problems

Long-term Impact:

- Reduce infant mortality by at least 50k/ year in developing countries, including Nepal
- Develop methods that can be translated for detecting other kinds of waterborne viruses eg. hepatitis, norovirus etc
- Ensure resilient economic development by promoting and investing in research, innovation & manufacturing capabilities in Nepal

Collaborators: Prof. Daniele Faccio (U of Glasgow, DLS expert)