Name of the Project: Piloting an affordable and real-time Water Assessment System (WAS) for detection of fecal coliforms in drinking water

Category : Environment

The Problem:

- 40% of water consumed globally is not tested,
- an estimated 2 billion people globally use drinking water contaminated with feces,
- >829,000 people (with >297,000 children) die each year from diseases transmitted via fecal-oral route because of fecal contamination of water,
- traditional approaches to testing water for fecal contamination require infrastructure (>30k$), testing-time (>18 h), training (~2Y post high-school) and/or expensive consumables (~5$/test), so are not conducive for implementation in the developing countries where such tests are mostly needed.

Our solution: A reagentless system, based on our unique flat Fresnel lens working in the deep-UV, to detect fecal contamination in water based on native fluorescence of tryptophan-based proteins synthesized by the fecal coliforms

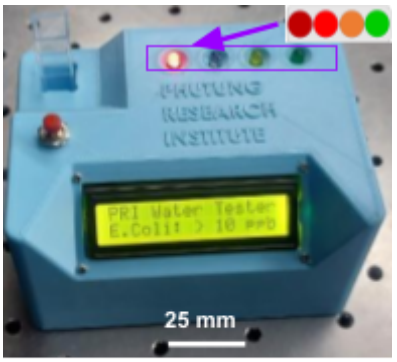

Fig. 1: A prototype WAS model with simple traffic light indicators and a LCD display to indicate level of fecal contamination.

Capabilities:

- Real-time (<1 min), low-cost (<$300 for a basic system), portable (< 1000 cm^3 ; < 1 kg) and user-friendly (basic traffic-light indicators according to WHO risk categories)
- 96% sensitivity to detect fecal contamination
- Detection of other contaminants in drinking water

Applications to real-world issues: early-warning detection of fecal contamination in resource-limited settings

Outcomes of the proposed project: By the end of the project, we will have piloted 20 beta models (Technological Readiness Level-8) WAS devices with >6 community-managed water user groups, >6 households, >2 municipalities in Nepal, and > 6 food and water-related industries in Nepal. While doing so, we will have:

1. obtained >18 early adopters paying a discounted price, and obtained a rating of >7/10 from the users based on their overall experience with our device,
2. adapted our system designs according to the corresponding user's key requirements,
3. improved the method of manufacturing the optical system on our premises in Nepal using a low-cost polymer process, with a performance comparable (within 10%) to those made using methods requiring high-end lithography,
4. improved methods to manufacture electronics and assemble the whole system to yield 99% consistency in performance across all devices,
5. secured ~$200,000 of seed funding for a new company to scale up and expand the sales in the countries around the globe (focused on developing countries).

Long-term Impact

- Reduction of water-borne diseases, especially in developing countries, improving lives and livelihood of billions of people around the globe,
- Direct economic impact on the country of Nepal, and to its scientific, R&D and innovation ecosystem.
- Acting as a role model by giving confidence to other researchers and entrepreneurs.

Collaborators/Advisors: Prof. Thomas Kraus (Nanophotonics), Prof. Marcel van der Horst (Electronics design), Mr. Arjan Rensema (New Business Development), Prof. Prof. Annelies Bobelyn (Product Design).