

(IRES) Development of Novel Paper-Based Devices to Assess the Quality of Pharmaceuticals and Water in the Developing World

Why we are doing this project:

When you give your child medicine to make her better, or a drink of water to quench her thirst, you trust that you are giving her what she needs. However, if you are a parent living in an area where up to 30% of the medicines are falsified or substandard and up to 90% of the water sources are contaminated with bacteria, what you might be doing is making her more ill. If the right technological infrastructure is in place, the tests needed to determine if the medicine and water is safe are relatively straightforward; an undergraduate student can carry them out. But, how do students with the required skills become passionate about a problem that isn't part of their daily life, and what if the technological infrastructure is absent? This NSF IRES program will give students from US colleges and universities the chance to be part of the stories of people who live with these problems. It will provide STEM students in the US the opportunity to form relationships that breed caring, and, perhaps most importantly, give them a chance to use their science knowledge and skills to make a difference.

Technical Abstract:

Our IRES project will engage a group of dedicated faculty and students to solve real problems in Nepal and Kenya using paper-based analytical devices (PADs). Three cohorts of U.S. and international students will work in the summers of 2017-2019 to develop PADs to analyze pharmaceuticals and drinking water. Students will design and field-test the devices, comparing the outcomes from the PADs with "gold standard" analytical methods. They will work at sites in Nepal and Kenya, where previous international collaborations by the PIs have laid the groundwork for safe living and working conditions for the participants and where the students can make genuinely useful contributions to ongoing projects. In the first year, US students traveling to Nepal and Kenya will spend two weeks together at their home institutions designing/manufacturing PADs while in electronic contact with their international counterparts, then spend four weeks in their respective country with international students, faculty, and families directly impacted by the study collecting samples, conducting field and lab testing (PAD, HPLC, and MPN tests), engaging in cultural activities, and meeting with experts, while remaining in electronic contact with the other country group. The final two weeks at the home institutions will be devoted to further analysis (e.g., HPLC-MS instrumental analysis of collected pharmaceuticals, MPN data analysis for PAD validation), presentation locally and with the international students (electronically), and report preparation for presentation to the appropriate country agencies at the conclusion of the study. Depending on the outcome of the first year, home institutional activities may be moved to the international sites for years 2 and 3, extending the time in-country.