Chip packets help make safer water in Papua New Guinea

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University of Adelaide mechanical engineering students and staff have designed a low-cost and easily made drinking water treatment system suitable for remote communities in Papua New Guinea (PNG) – using foil chip packets and some glass tubing.

The system makes use of UVA radiation direct from the sun to kill pathogens in the water in a continuous feed facility that can be made from improvised materials that are readily available in PNG.

"Worldwide, 780 million people still don't have access to safe and clean water for drinking, cooking or washing," says Dr Cristian Birzer, Lecturer in the School of Mechanical Engineering, who supervised the students with Dr Peter Kalt.

"Consumption of untreated water exposes people to a range of contaminants including faecal-borne pathogens. It's estimated that 1.5 million people – and 90% of them children – die every year from consuming untreated or contaminated water."

The team worked with ChildFund Australia to learn about local conditions in the Papua New Guinea highlands. Many villages there use large communal rainwater tanks to collect water in the wet season, supplemented with river water in the dry season. Both sources are prone to pathogens in the water.

"Our priority was to develop a system with, and not just for, the end-

users," says Dr Birzer. "We wanted something where we could provide design guidelines and let the local communities build and install their own systems using readily available materials that could be easily maintained and replaced."

The students – Michael Watchman, Harrison Evans, Mark Padovan and Anthony Liew – first designed and tested a workshop-quality manufactured system using high-quality materials. They then designed, built and tested a hand-made rudimentary system using some plywood, glass tube and high-density polyethylene plastic sheeting coated with metalised plastic (chip packet wrappers) and specially shaped to reflect the maximum amount of sunlight onto the water in the glass tube.

"The students trialled various reflectants and found the inside of crisp packets was as good as anything," Dr Birzer says. "The total system cost $67." The designs have been presented to ChildFund in PNG.

The UVA from the sun produces "reactive oxygen species" in water which damages the DNA of pathogens and deactivates them. Testing for E. coli, in collaboration with Dr Connor Thomas in the School of Molecular and Biomedical Science,showed the system could reduce high concentrations of the pathogen to undetectable levels in the water in under 30 minutes.

"The system can successfully treat close to 40 litres in four hours and the beauty is that it's designed to be modular, so more modules can be added for greater quantities of water," says Dr Birzer.

Provided by University of Adelaide