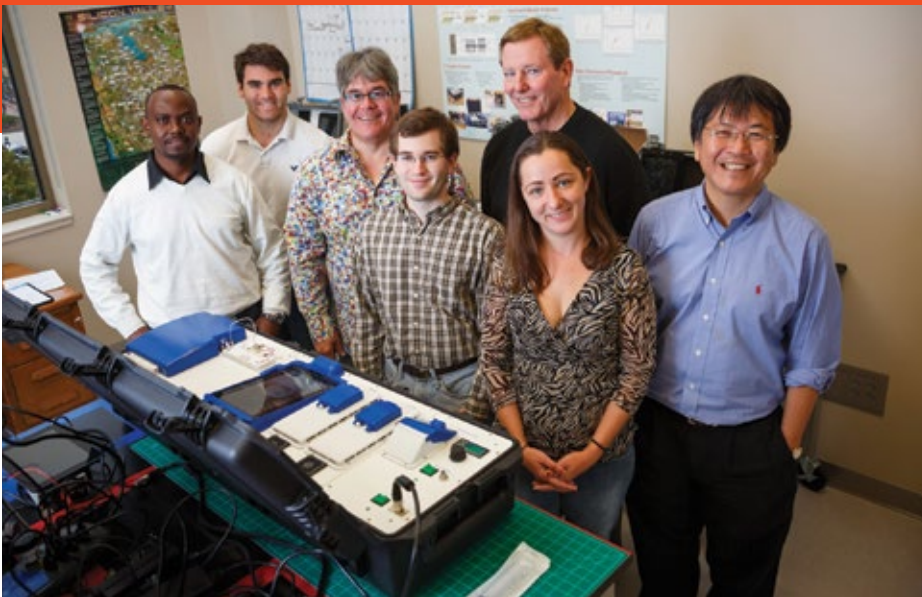


Fighting the battle against infectious diseases

The specific detection of pathogens has a crucial role to play in ensuring control of infectious diseases. Scientists at F Cubed have developed a novel molecular analyzer – the NESDEP IU Molecular Diagnostic System – which relies on Tecan’s Cavro® Smart Valve and Cavro Centris Pump to offer straightforward identification of pathogens in a matter of minutes.



The team behind the NESDEP IU Molecular Diagnostic System. Left to right; Charles Sefuku, Dan Kocen, F Cubed founder and CEO Les Ivie, Chris Chanelli, Bob Williams, Shaunasee Kocen and Professor Chia Chang

“The pump is extremely accurate and precise in its measurements.”

F Cubed, LLC, based in Indiana, USA, develops technologies to enable rapid, direct identification of genetic materials with portable devices. The Company’s NESDEP IU Molecular Diagnostic System is designed to detect a wide range of pathogens – including *Escherichia coli*, *Listeria*, *Clostridium difficile*, MRSA and parasitic worms – offering femtomolar specificity from ultra-small sample sizes. This analyzer is already being used in several projects within the food industry, where *E. coli* and *Listeria* are important pathogens, as well as the University of Notre Dame Haiti Program, looking at lymphatic filariasis. F Cubed technical manager Chris Chanelli explained: “The NESDEP analyzer is an integrated unit that enables the user to perform sample preparation and analysis on a biochip. We designed the analyzer to be easy to use with minimal training, and very robust, enabling an operator with just a small degree of knowledge to perform the analysis. Although

we envisage the analyzer being used in a laboratory at the moment, we ultimately hope to see it in use in a field setting, such as a hospital emergency room.”

Chris continued: “Sample preparation is a simple filtration step – a vacuum unit is included in the analyzer – to remove debris which might otherwise block the biochip’s microchannels, followed by cellular homogenization to release the DNA. Detection of single-stranded DNA is then performed using a microfluidic biochip developed by Professor Chia Chang’s group at the Department of Chemical and Biomolecular Engineering, University of Notre Dame. This allows us to get very specific readings of pathogens – based on the genomes that have been sequenced – in a variety of fluids, including waste water, blood and sputum. The device accommodates volumes of 50 µl, although the actual sample volume prepared varies depending on the material being analyzed. In waste water, for example, the number of bacteria per volume of liquid can be very, very low, and it is important to prepare a large enough sample volume for analysis. In blood, bacteria levels are likely to be much higher, and a smaller sample volume will suffice. The system is so specific that the presence of bacteria other than those being analyzed is not a problem; they will not be detected without the correct complementary codons.”

“DNA analysis using a biochip requires accurate, precise control of liquid dispensing, and this was one of the reasons we chose the Cavro Smart Valve and Cavro Centris Pump



for the NESDEP analyzer. The Tecan Cavro components are very easy to control once you are familiar with the coding language, which has enabled us to program a tablet computer to control the entire microprocessing unit; the user just selects the test menu and enters the required sample information. Several different fluids are used during the analysis, and the Cavro Smart Valve and Cavro Centris Pump play a crucial role in ensuring that these pass through the biochip in the correct order, stabilizing the system before and after the analysis. The pump is extremely accurate and precise in its measurements, which is particularly important when you are working with microliter volumes – an error of just 0.1 or 0.2 μl can have a big effect on the system's calculations."

"Initially, we weren't sure how much wear and tear would be inflicted on the system, or how difficult it was going to be to manipulate everything properly, and we were attracted to Tecan because we knew that the Company offered one of the biggest and best ranges of pumps and valves, and that they were very robust components. We sometimes use saline solutions and, occasionally, the salt – and other solutes – will come out of solution. The Cavro Centris Pump copes with this really well. Fluid can be continually flushed through until the precipitate redissolves and, in cases where crystallization occurs, the pump is robust enough to push through the salt

formations. The Cavro Smart Valve and Cavro Centris Pump have been a very good choice. The pump has proved very reliable and its consistency is impressive; we know that it is basically going to last forever," concluded Chris.

To find out more on Tecan's Cavro Smart Valve and Cavro Centris Pump, visit www.tecan.com/components

To find out more on F Cubed, visit www.fcubed.biz



The Cavro Smart Valve and Cavro Centris Pump are key components of the NESDEP analyzer



F Cubed's NESDEP analyzer enables single-stranded DNA to be detected in a microfluidic setting