

May 05, 2011

ZyGem, Lockheed Martin Aim to Speed Forensic DNA Analysis with Portable, Automated Platform

By [Ben Butkus](#)

When the US government announced last weekend that it had killed Osama Bin Laden, officials cited a positive DNA test as one of the key reasons military personnel were sure that they had gotten their man.

Despite the fact that the testing was likely performed in a relatively remote location and short amount of time, current standard PCR-based techniques could have easily been employed in a regional laboratory to produce a positive DNA identification of Bin Laden, according to experts (see [related story, this issue](#)).

That may be true, but if ZyGem had its druthers, a military official without significant laboratory training would have been able to test DNA from Bin Laden in the field in about an hour using a fully automated and portable DNA analysis system currently being developed at the company with support from Lockheed Martin, company executives said this week.

"Current technology incorporates a large number of instruments and can take anywhere from six to 10 hours, depending on how fast the systems, extraction, sample prep, PCR, and maybe capillary electrophoresis are," ZyGem President and CEO Paul Kinnon told *PCR Insider* this week.

"But in reality, that's a long time [and needs] a qualified, trained technician," Kinnon added. "We're planning to launch an instrument platform that basically would allow you to put the sample in and get an answer out in [less than] 60 minutes, using all the standard reagents currently used by the ... law enforcement community. Basically it will be a very fast and simple sample-in, answer-out platform."

As reported previously by *PCR Insider*, ZyGem first disclosed that it was developing the system, called Rapl.D., in September at the National Institute of Standards and Technology and National Security Agency's Biometrics Consortium Conference in Tampa, Fla. ([PCR Insider, 9/23/2010](#)).

This week, Kinnon, along with John Mears, director of biometric solutions at Lockheed Martin, told *PCR Insider* that a beta version of the system has been completed and is now in internal laboratory testing.

"We will evolve that to a pre-production unit around the end of this year," Mears said. "That's the phase we're in right now, and we expect that to go into some limited field [testing] at the beginning of next year."

The current version of Rapl.D. combines sample prep using a proprietary ZyGem lysis and DNA extraction technology, with PCR amplification, capillary electrophoresis, and analysis into a portable platform "just slightly larger than a PCR tower," Kinnon said.

Future iterations of the system will be "more compact," Kinnon said, such that it "would be truly portable, where it could possibly fit in the back of someone's rucksack out in the field."

Besides ZyGem's sample prep method, a key technology in Rapl.D. is so-called infrared PCR, a technique developed by University of Virginia professor and ZyGem CSO James Landers, who also founded UVA spinout company MicroLab Diagnostics, acquired by ZyGem in May 2010 ([PCR Insider, 5/26/2010](#)).

ZyGem has an exclusive license to the infrared PCR method from the University of Pittsburgh, where Landers developed the technique before he moved on to UVA. Kinnon said that is just "one of the key patents" developed in Landers' laboratories over the past 15 years to which ZyGem has a license.

According to Mears, ZyGem and Lockheed Martin anticipate that Rapl.D., once commercialized, will target three key markets: military intelligence and defense, law enforcement, and homeland security, particularly immigration.

"What we've seen in the last few days is a good example of using DNA as a biometric to make familial inferences ... and inferences about the DNA of a sample donor to compare to existing family members," Mears said.

"That's also useful in the case of immigration, where a number of people may be representing themselves as relatives of a person who is given leave to immigrate to the US – but in some cases they've falsified their documentation," Mears added. "Perhaps it's in pursuit of human trafficking, smuggling, slavery – that type of thing. And what the US Department of State and [Citizen and Immigration Services] would like to do is basically have the ability at an embassy or consulate, or a USCIS location, to actually test whether people are really related or not."

As such, "having an instrument that doesn't require a certified DNA technician, and can provide a result very quickly while people are in queue, would be a very useful application," Mears said.

Other homeland security applications for Rapl.D. might include rapid identification of disaster victims or, for instance, "reuniting lost children who may not be able to communicate well with their parents," Mears said.

"And the obvious one, and probably the biggest market volume-wise, is law enforcement," Mears added. "If you've got a limited period of time in which you can hold a [suspect], perhaps you'd like to test quickly to see if [their DNA] is a match to a crime scene."

Whatever the application, the final goal is to commercialize "a compact unit that is very easy to use and will give us an analysis sub-60 minutes using the reagents that are currently in the marketplace, so anyone in the field can use it rapidly and get the same results they would with some of the very large and cumbersome products currently on the market," Kinnon said.

The two most commonly used reagent kits on the market for forensic analysis are from Life Technologies' Applied Biosystems business and Promega, Kinnon said, adding that ZyGem and Lockheed Martin plan to develop Rapl.D. for use with those products.

"The goal here is that we're not reinventing the process," he said. "We're migrating the process onto a miniaturized platform ... and doing exactly the same as [is] done currently with similar reagents, but we're going to miniaturize it and make it faster."