Waving their magic wand

By Cathy Wever | 15th October, 2012

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After 10 years of research, securing a patent for their portable radiation detector is a great triumph for three Wollongong researchers.

Inventors of the Liana radiation detector, Dr Michael Lerch (left) and Professor Anatoly Rozenfeld, both from the University of Wollongong's Centre for Medical Radiation Physics.

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In 2002, Professor Anatoly Rozenfeld and Dr Michael Lerch, both from the University of Wollongong's Centre for Medical Radiation Physics, teamed up with Ukrainian scintillator expert and visiting professorial fellow Professor Alex Gektin.

Together, the trio began working to take their idea of a small, portable radiation detector from a simple concept to something that was marketable to a worldwide audience.

Now, after a decade of research and collaboration, the three men have successfully filed a US patent for a portable radiation detector capable of applications, including cancer tissue identification, improved screenings of radioactive material and assisting in border security.

Lerch says the detector, which they have named Liana, can help accurately identify cancer tissue.

"The detector can be used initially to locate cancer tissue and tell doctors what stage the cancer is at. Then, during a surgical procedure to remove cancer tissue, the detector is portable enough to be used in theatre. It can accurately differentiate cancer tissue from healthy tissue, helping surgeons to remove only cancer tissue, while leaving healthy tissue intact," he explains.

The detector employs electronic anticoincidence or Compton suppression technology, which means the probe can perform its function even against a high energy radiation background.

"For example, cancer patients are often injected with a radioactive tracer such as a PET tracer, prior to surgery. These tracers emit gamma radiation, which is of such high energy that it can mask the location of tumour cells amongst the surrounding normal tissue. Using Liana, even small foci of cancerous cells can be accurately identified despite the interference from the background gamma radiation, and removed," Lerch says.

Rozenfeld, who is CMRP's director, says that in addition to its muti-functionality, a key advantage of Liana is its size.

"It's very small. In a medical setting it would only be the size of a small pen, while in a security environment it would be more like a large, hand-held torch. In either case, it's significantly smaller than anything else that's out there."

As well as medical applications, Liana can be used in border control and security, because it can correctly identify radioactive materials in luggage or cargo.

"From time to time, people try to smuggle weapons-grade isotopes such as plutonium or uranium even into politically stable countries. The usual ploy is to mask the prohibited material using natural and medical isotopes. The Liana probe can actually identify the radiation signatures of forbidden isotopes even when acceptable radiation is present."

"It's the ideal tool for customs officers, the police and other emergency services because it is effective yet very portable and can be used in `on the spot' situations."

UoW is working with the Australian Nuclear Science and Technology Organisation to explore the potential of the technology for improving border security.

"Improving the technical means to detect illicit radioactive materials in a border security context is an important challenge recognised by the International Atomic Energy Agency. ANSTO is pleased to bring its expertise in radioisotope identification to further progress the UoW technology," said ANSTO's Dr Mark Reinhard.

In coming up with the idea for the Liana probe, Rozenfeld and Lerch say they were looking to fill a niche in the market. "We knew there was demand for a small, portable radiation detector. We worked hard on optimising the design of our product so that it would be quick and easy to operate, delivering the best possible results despite its compact size," says Lerch.

"There are many other radiation detector probes out there but they are larger and more bulky, so they don't have the diverse level of functionality that the Liana has. Not only that, Liana costs only a fraction of some of the larger radiation detectors. To make potentially lifesaving technology like this available across a wide market, it needs to be practical but also relatively inexpensive."

Still, it is a challenge to successfully take any invention to market.

"We've achieved this project despite managing full-time teaching loads, administration, students and other projects on the go. It would have taken us a lot less than 10 years if we'd been able to devote ourselves to it full-time," says Lerch.

He is also wary of competition. "It happens all the time that someone invents something ahead of you and you get pipped at the post. You have to be a bit mindful not to discuss your ideas too much, especially at conferences, just to be on the safe side."

Despite a decade-long investment in time from the research team, funding for the development of the detector was virtually non-existent. "I had been awarded a National Health and Medical Research Council grant, to develop positron emission tomography detection strategies in nuclear medicine. Michael joined me on the project and Liana was an idea we developed in parallel to the work we were doing," says Rozenfeld.

The only direct funding the inventors received was a small $40,000 grant from the Cure Cancer Australia Foundation to build and test an initial prototype.

"This just shows what effect even such a small grant can have. Targeted financial contributions to research projects can have a powerful impact and we are very thankful to the Cure Cancer Australia Foundation," says Rozenfeld.

He and Lerch are looking for a business partner who can help them develop a commercial prototype for use in medical situations. "We'd love to get it made here in Australia," says Rozenfeld.

Commercialising an invention requires a huge team effort, says Holly Zhu, UoW's commercialisation manager, medical radiation physics, ICT, education and media.

"In managing the university's intellectual property, we assess any new technology to see if it has value and marketing opportunities. Obtaining a patent is a big plus in terms of finding a commercial partner. In the case of the Liana detector, we see huge opportunities because it tackles two of the major challenges in radiation detection – distinguishing between radiation emissions from different sources and being easier to operate," she says.

It takes many years before any new invention, particularly medical devices to become widely used, Zhu says. "In many ways homeland security is easier to tackle than the clinical market. It usually takes 10 or even 20 years for a medical device to be invented, patented, produced then made widely available."

"We really need the support of the Commercialisation Office. Marketing is not something academics do a lot of!" adds Lerch, who also says that taking a good idea and making it a commercial reality is another way that research is becoming more accountable.
"It's one way researchers can show the value of their work – by turning it into dollars and `paying off' the investment in the research."

For Lerch the project has been hugely satisfying. "To realise an idea and to make a contribution to cancer therapeutics is very gratifying. Everybody has been or will be

affected by cancer in some way during their life.

"My father and sister both died from cancer while in their 40s, and many of my colleagues at the CMRP have been affected in similar ways and, although we are not medical professionals, this is a way we can contribute to improving the treatment of this disease. I feel very proud to be contributing in this way."

Small grants, big results

Despite the dual application of the Liana radiation detector in both medical and security settings, the development of this potentially lifesaving device was not government funded.

The inventors received a single, $40,000 grant from the Cure Cancer Australia Foundation, which was enough to see them take their idea from concept to fruition, showing how worthwhile even a small donation can be.

The foundation's research program manager, Edith Hurt, says she is thrilled to hear of the invention's progress.

"It's fantastic! It's great to have contributed in a small way to something that's about to be commercialised. It's a thrill for our organisation as well as all our supporters, to know that we've contributed to something that's going to have such an impact on cancer treatment."

Cure Cancer's funds projects targeting all cancer types and treatment approaches, nationally. Their overarching goal is to promote innovation and leadership in research.

"Our specialty is funding people early in their research careers. We hope to help further their careers so that they will stay, and hopefully make significant progress in, the area of cancer research. We also hope they will then provide leadership and support to other young cancer researchers coming up the ranks behind them," Hurt says.

Since it was established in 1967, the foundation has funded more than 400 early career researchers including 30 this year.

From lab to the market

Rozenfeld and Lerch spent 10 years working on their novel, portable radiation detector. After securing an Australian patent five years ago, a US patent was granted by the US Patent and Trademark Office just this year. An application for a European patent is pending. Despite the lengthy process involved in getting his invention to market, Rozenfeld says the experience has been completely worthwhile and he is looking forward to finding a commercial partner who can deliver the invention to a global market.

"In particular we're pleased to have secured a US patent. The US is the largest market in terms of both medical and homeland security, so we see real opportunity for our invention in this country." In addition to the Liana device, Rozenfeld and the UoW's Commercialisation Office are working on commercialising a number of different radiation detection instruments for medical application.

While the inventors would like to see the Liana made locally so Australians share some of the benefits, UoW's commercialisation manager, Holly Zhu, says a business partner could come from anywhere in the world.

"We are looking worldwide to locate partners with whom we can realise both clinical and homeland security commercialisation opportunities. We are currently speaking with a number of companies in the US as well as others."

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