FASTER AND EASIER COLON CANCER DETECTION

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Efficient testing for improved patient outcomes

In the struggle against one of Europe’s major cancers, LIQBiOPSENS has developed a prototype machine that could prevent colorectal cancer deaths with effective and simple patient testing. The team of researchers hope to expand their product for widespread use.

Colonial cancer, referring to cancer beginning in either the colon or the rectum, is one of the deadliest cancers in the EU, according to the World Health Organization. While it is possible to prevent cancer with certain lifestyle changes, a significant amount of cancer deaths can be reduced by simply detecting and treating it at its earlier stages. However, especially in terms of colorectal cancer, popular detection techniques can be invasive, painful or inefficient. A project co-funded by the EU’s Horizon 2020 programme called LIQBiOPSENS, focusing on tackling colorectal cancer detection earlier, promises to introduce this novel diagnostic system to the market. LIQBiOPSENS combines two technologies delivered by AWSensors and DestiNA Genomics. AWSensors provides the sensing technology and engineered platform needed to access liquid biopsies. The LIQBiOPSENS platform is constructed from AWSensors high-frequency, highly sensitive acoustic wave sensor, along with their microfluidic circuitry to move the clinical samples over the sensor. DestiNA Genomics provides LIQBiOPSENS with the chemical reagents necessary to detect ctDNA mutations. DestiNA’s chemistry needs a platform, so the LIQBiOPSENS project has brought together the “printer and the ink” so to speak, enabling the building and testing of the combined technology. Explains Hugh Ilyine, CEO of DestiNA Genomics: “This integration technology can provide a simple, low cost and real-time-based test, enabling error-free detection of cancer mutations in blood samples, and can be an important player in the future market of liquid biopsies.”

SHARING MEDICAL ADVANCEMENTS

The LIQBiOPSENS project has made significant progress in its research and innovation and has now set goals to achieve the commercialisation of their liquid biopsy product. Firstly, the project team is working towards evaluating their product according to the perspective of end-users, being the medical professionals. Through this evaluation, new features are being selected and included in the platform and product to improve its commercial potential, with both software and hardware modifications to the system underway.

In the journey towards commercialisation, LIQBiOPSENS has reached some critical checkpoints. So far, production price of AWSensors cartridges has been lowered while their performance improved, and the production of the chemical reagents has been optimised. Additionally, progress towards experimental use of the LIQBiOPSENS platform has been installed in the Genyo Centre, this important milestone makes it possible to proceed towards the validation phase of the technology in a more real-world environment, explains Arnau.

A first version of a fully integrated platform has been installed in the Genyo Centre. This important milestone makes it possible to proceed with the validation phase of the technology in a more real-world environment.

Ilyine also stresses the importance of distributing their technology more widely. Success with the technology development and commercialising of the LIQBiOPSENS colon cancer assay platform and will quickly lead to further market interest to develop additional assays for a range of cancers, enabling economic growth, and the chance to become global leaders in cancer detection, he says. With more extensive use of liquid biopsies targeting colon cancer, it is possible that unnecessary cancer deaths that plague countries year after year will begin to be reduced.

A BRIGHTER FUTURE

Not only does LIQBiOPSENS detect and monitor colorectal cancer quicker, more precisely and more cost-effectively than other systems on the market, it has the potential to accelerate development of a European based cancer diagnostic industry. With cancer as one of the leading causes of death in Europe, it has become imperative to develop more efficient ways to identify it faster, paving the way for improved quality of life and life expectancy. The LIQBiOPSENS project took on this challenge and has so far been successful. The next step is to complete its platform validation, and communicate the assay opportunities of this unique project to the medical profession, patient groups and funders, so as to realise a commercial and medical success story for European researchers and biotechnology companies.
**Impact Objectives**

- A novel diagnostic platform for detection of KRAS and BRAF mutations in colorectal cancer using blood liquid biopsy

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**Faster and easier colon cancer detection**

*Professor Antonio Arnau and Hugh Ilyine discuss their work on LIQBIOPSENS, a project developing an innovative way to identify colon cancer earlier through integrating sound waves, microelectronics, microfluidics, nano-materials and genomics*

Could you share some information about LIQBIOPSENS?

**AA:** The overall aim of the LIQBIOPSENS project is the further development and validation in real settings of a novel diagnostic platform for the early and fast detection of circulating tumour DNA (ctDNA) and their KRAS and BRAF mutations associated to colorectal cancer through blood samples. The main features of LIQBIOPSENS are: reliability (detection rates vary from 95–100 per cent); low-cost (40-50 euros per sample analysis); sensitivity (in the zM range); multiplexing capabilities (analysis of 27 KRAS and BRAF mutations simultaneously); short analysis time (30-60 minutes); user-friendly interface; and flexibility.

The LIQBIOPSENS platform is based on the integration of two novel complementary technologies. On the one hand, the revolutionary DGL© technology of DestiNA Genomics Ltd, capable of delivering faster, more error-free detection of nucleic acids and their mutations than current enzyme-based detection systems, making "false positive" results a thing of the past. On the other hand, the novel high-resolution acoustic wave microsensor technology property of AWSensors, that allows an accurate, inexpensive, label-free, direct and real time transduction method to quantitatively evaluate the results of the application of the above mentioned DGL© technique.

What is the importance of this work?

**HI:** Each year in the European Union over 300,000 colon cancer cases are reported, more than 140,000 in the US and over 2 million worldwide. Colon cancer is the second most prevalent female cancer and the third most prevalent for men. By combining novel sound wave sensing and unique “SMART Nucleobase’ chemistry intellectual property, the LIQBIOPSENS project investment has enabled the engineering of a detection platform prototype and to demonstrate its technical performance through to patient sample testing.

Ultimately, who will benefit from the learnings?

**HI:** The big winners in the development of an improved test for colon cancer will be patients. The potential exists for the LIQBIOPSENS assay when commercialised to be used for both confirmatory diagnosis as well as for prospective population screening.

It represents a unique opportunity to enter a globally significant market and develop a market leading role.

Though screening for colorectal cancer has the potential for earlier disease detection and much improved chances for patients to live better and longer, the poor sensitivity of faecal blood tests and high cost of new DNA mutation tests, which are seldom used in the EU, hinder market growth. What is clearly needed for the national health services of Europe and improved patient care is to have a test such as the LIQBIOPSENS assay, which combines sensitivity and accuracy with a far lower cost per test.

How important has the contribution of the partners been on this project?

**AA:** All the partners play an important role in the project due to the different knowledge and knowhow necessary to be combined in only one device. As an innovative project with a goal focused on the commercialisation of a final instrument, additional expertise in the different competitive technologies already existing in the market is necessary, as well as the validation of the final device in a real environment. For this reason, a balanced contribution of all the partners is a key aspect and the project team was devised with this objective.