

DETECTING AND MONITORING CANCER FROM BLOOD SAMPLES

EASY-TO-PERFORM LIQUID BIOPSIES promise to detect cancer earlier and enable doctors to more easily monitor response to treatment

It is unusual for a company to encapsulate what it does so neatly in its name. IMBdx, an acronym for 'in my blood' combined with the medical abbreviation for 'diagnosis', leaves little doubt what this South Korean biotech start-up is about — developing blood biopsies for diagnosing cancers and monitoring how they respond to treatment.

This technology is based on information carried in plasma in what's known as cell-free DNA — tiny shards of DNA shed by cells, both healthy and cancerous ones. Healthy people typically have a fairly stable concentration of cell-free DNA in their blood, but cancer causes it to increase.

Cell-free DNA can be used for more than just indicating the presence of cancer. DNA molecules from cancer cells show patterns such as the single-nucleotide variants that can cause cancer in certain people as well as other recognizable configurations associated with modifications such as methylations and copy-number variations. This information can indicate the extent, type, and location of cancer in the body. The huge leaps made in the past decade

in rapid sequencing technology are making the detection and interpretation of those patterns increasingly feasible.

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HUMBLE BEGINNINGS

The origins of IMBdx go back a decade to the early days of the next-generation sequencing revolution when two of the co-founders of IMBdx, Tae You Kim and Duhee Bang, began working together. "Kim and I started collaborating in 2011-2012 to profile patterns of cancer cells using massively parallel sequencing technology," recalls Bang, who specializes in developing core technology at IMBdx and is a professor at Yonsei University. "After a few years, we became aware of the potential to use it in liquid biopsies." Kim, medical oncologist and professor at Seoul National University and chief executive officer at IMBdx, co-founded the company with Bang about four years ago in

order to develop an innovative liquid-biopsy platform across the continuum of cancer care. The company was the first in South Korea to use liquid biopsies in this way, and it remains the only company focusing solely on them.

IMPROVING DATA ANALYSIS

Although it is still early days, the scientists are convinced of a promising future in using blood samples rather than hard tissue to diagnose and monitor cancers. Liquid-biopsy technology is attractive for patients because taking blood samples is much less invasive than performing hard-tissue biopsies.

Kim and Bang are especially excited about recent developments in machine learning that are improving the assessment and interpretation of the vast amounts of information available from a liquid biopsy.

The two scientists are also optimistic because of the capabilities for advanced tumour profiling being shown by technology patented by IMBdx, known as the AlphaLiquid series, which can interpret tiny amounts of cell-free DNA from tumours and suppress false

positives that can often be thrown up during a liquid biopsy.

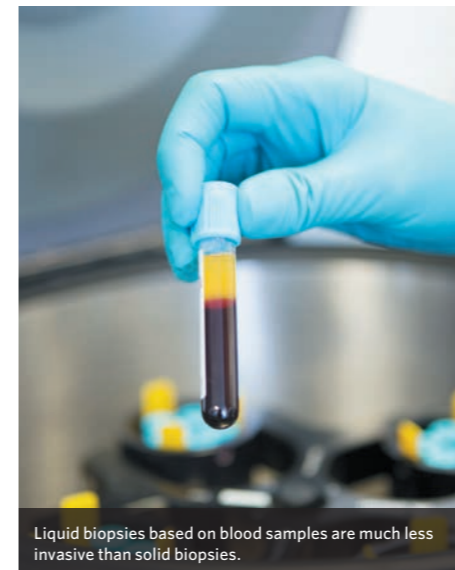
DETECTING AND MONITORING CANCER

By detecting DNA fragments from tumour cells circulating in the blood, a liquid biopsy can help to detect cancers at an early stage when they are easier to treat. Being able to take and interpret multiple samples of blood over time would allow treatments to be better tailored to disease progression in a patient by monitoring molecular changes in tumours in response to treatment.

"This is a powerful method for spotting the emergence of mutations during treatment," says Kim. "During long treatments for cancer, we can detect resistance and immediately apply the right treatment for that resistance." It would allow clinicians to stay one step ahead of the natural defences being thrown up by tumours as it mutates in response to treatment.

MONITORING THE BODY RATHER THAN A TUMOUR

"Liquid biopsy is also a good technology for capturing information from many different types of tumours," Kim notes.



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Liquid biopsies based on blood samples are much less invasive than solid biopsies.



A scientist measuring cell-free DNA in blood samples using technology developed by IMBdx.



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Fragments of DNA from tumours can be detected in the bloodstream, enabling doctors to detect and monitor cancer.

"Conventional hard-tissue biopsies harvest tissue from just one site, and so you obtain genetic information only from the tumour at that site. In contrast, a liquid biopsy allows you to glean information from the whole body, because all the genetic information is released into the blood stream."

Clearly, the ability to investigate blood in this very

precise way is a potential game changer for diagnosing and monitoring cancer. It could easily be used to screen people who are genetically disposed to develop certain cancers. It could also be used as a population-wide screening tool, allowing treatment to be initiated at a very early stage, well before the disease exhibits physical symptoms. Furthermore, liquid

biopsies could be developed to detect virtually every form of cancer, from lung to bowel, from pancreatic to ovarian.

REALIZING THE POTENTIAL OF THE TECHNIQUE

Cost is currently the main hurdle to this revolution, so IMBdx is seeking to make liquid biopsy more affordable and accessible to more people. The company is

now preparing for the launch of their minimal-residual-disease detection service and a pan-cancer screening platform for early detection, which utilizes whole-genome methylation pattern analysis. ■



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