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## Startup Mantra: Using breath to detect cancer

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Jilma and her husband Suman have developed a patented technique that can detect breast cancer by CanScan

Pune: Over centuries, smell has been associated with good, bad, aromas, perfumes and even stink. But who would have ever thought that your nose held the secrets to your health? That every time you exhale, your breath tells a story about your body? Hidden in that breath are clues to the state of your health. How, one may wonder? But then science is almost magical that way. It can find hidden secrets that can simply fascinate you. Like it did for Jilma Peruvangat who was doing her M Tech at the Defence Institute of Advanced Technology, Pune.



Jilma and her husband Suman have developed a patented technique that can detect breast cancer by CanScan. (HT)

“We were working on sensor technology and I was the person with the biotech background. There were reports about the sense of smell that dogs possess and how it was possible for them to detect cancer in humans simply by sniffing the person’s urine. That set me thinking. Most diagnostic tests that we need require a needle prick. So, I thought why not develop a diagnostic tool that can detect disease with one’s breath?” said Jilma.

But since the diagnostic field is so very vast, the question was which disease should they choose to develop this new diagnostic tool?

“The question was which disease to pick for the breath analysis technology? Being a woman, I was very keen on working towards advancing women’s healthcare. When we delved deeper into it, we understood that breast cancer is a significant issue in India. And it was impacting many women under age 45, where a mammography was not recommended. It was like a Catch-22 for them. The test to detect cancer is not recommended if you are under 45, and later it may be too late to treat a cancer,” she said.

It was a serious problem that was looking for a solution. Jilma read up a lot of scientific literature surveys and got to know that it is possible to detect breast cancer by exhaled breath analysis. And that was the starting point of Kozhnosys Pvt Ltd, the startup that has built the technology to detect breast cancer via one’s breath.

## **Developing the tool**

The starting point of what is now known as the CanScan was data.

“We started our work in 2017, collecting and analysing the chemical components in exhaled breath of breast cancer patients and healthy women with the help of a mass spectrometer. After analysing the breath of 100 subjects, we could identify a pattern of chemical compounds that differed from the compounds present in healthy women,” Jilma said.

But that was not all. “We also understood that the concentration of these compounds was very low, in the levels of parts per million and billion. We realised that to detect these compounds in exhaled breath, we had to develop a device sensitive enough to detect such low concentrations. After conducting a lot of market research, we found that there were no sensors available that could detect concentrations in parts per billion, especially for the compounds we were looking for. We realised that we had to create sensors in our own lab to make the technology work,” she said.

Thus far, Kozhnosys was using the facilities available at Venture Centre, Pune prime incubation centre for science-based startups.

“The mass spectrometer we used was theirs. They have top-of-the-line lab and machinery and infrastructure that is not possible for a startup to invest, especially in the early days. In fact, they even helped us raise government grants and gave us valuable guidance,” she said.

Jilma and her husband Suman Mohandas, a software engineer, launched the venture in 2017. While Jilma analysed the breath and its components, Suman developed the technology that could do the detection.

## **How does it work**

Jilma said, “Extensive research has shown that breast cancer patients exhibit a distinct pattern of volatile organic compounds (VOCs) in their exhaled breath, detectable through mass spectrometry. To address this, we have developed highly sensitive sensors capable of detecting these compounds at concentrations as low as parts per billion, surpassing the capabilities of existing market sensors.”

She compares it to a dog sniffing for bones. “Just like how a dog has an incredible sense of smell and can identify the unique scent of a bone hidden underground, we’ve discovered that the breath of breast cancer patients contains unique chemicals that are different from healthy individuals. Traditional methods might miss these tiny traces, but our device has super-sensitive sensors, much like a dog’s keen nose. These sensors can pick up even the smallest amounts of these unique chemicals in breath.

“Instead of undergoing procedure like mammography that uses X-rays, you simply breathe into our device. It’s quick, easy, and painless. We’ve tested our device on many people, much like how you’d test a dog’s ability to find bones in different locations. These tests have shown that our device can accurately identify the unique chemicals associated with breast cancer.”

Like every scientific discovery, it needs to be tested in the real world to know how well it works. Kozhnosys is conducting clinical trials ongoing across hospitals in Pune.

“So far, we have tested it on more than 150 subjects and the CanScan shows an accuracy of more than 95%,” she said.

In 2020, Jilma and Suman filed for a patent that is being awaited.

“We are committed to validating and refining the device in

accordance with regulatory requirements in India and abroad, to meet the highest standards of accuracy and reliability. We believe this groundbreaking technology holds the potential to revolutionise breast cancer screening and improve outcomes for countless women,” she said.

### **Swimming in the blue ocean?**

As of now, there are no known tests in the market that do breath analysis for breast cancer, leaving the market wide open for CanScan. But like any startup founder Jilma is well aware of the competition in its many forms.

“There are a few firms in the UK and the US that do breath analysis for cancer, but they do it on a mass spectrometer. We offer a portable device that is accurate and can do the same. Not only can this test be done for women under 45, but it can also be used in remote areas in rural India where breast cancer is showing up and access to any healthcare unit is very difficult,” Jilma said.

Besides the CanScan being portable, it seems quite indomitable at least for now. She is aware that there are big giants like Siemens, General Electric, Philips Healthcare and others who develop tools for medical diagnostics. “For any company to work in this space, they will have to start from zero. They will have to work on developing their own sensors and a different device since our technology is patented. It is also possible that they will need to spend a lot of time like we did as well as R&D,” she said.

### **Money**

Kozhnosys started with Biotechnology Industry Research Assistance Council’s (BIRAC) grant support.

We have raised grants from NIDHI, MSINS (Maharashtra state Innovation Society), IITMIC (IIT Madras Incubation Cell), Venture Centre, MiETY SAMRIDH programme, BFI Kick starter initiative and CSR funds from Indus, Bharat Seats. We have raised equity funding from Edney Enterprises and Venture Centre. Totally, the grants raised were ₹1 crore and investment was ₹2.7 crore,” she said.

Jilma wants to further raise funds to get a Central Drugs Standard Control Organisation (CDSCO) manufacturing licence and do pilot sales. “Currently, our trials are ongoing and we have tied up with a facility in Talegaon that has patients visiting from many nearby villages. We aim to tie up with government hospitals as well eventually,” she said.

Her plans for manufacturing include part outsourcing. “We aim to tie up with other manufacturing companies to outsource parts of our machine like the outer covering and the printed circuit board. We will manufacture sensors in-house and plan to start a small facility that is estimated to cost ₹4 crore. We plan to raise funds from VCs and are in talks with investors,” she said.

### **Future plans**

Jilma plans to expand the scope of CanScan to other diseases. “We plan to further advance the capabilities and reach of our CanScan breath analyser and explore new frontiers in breath analysis technology. Beyond breast cancer, we are exploring the potential to detect other diseases such as other cancers, diabetes, and infectious diseases. By expanding the applications of our technology, we can address a broader range of healthcare needs. Continuous research and development will enhance our technology,

leveraging advancements in AI and machine learning. We will scale up manufacturing and establish a robust distribution network to meet market demand. Public awareness campaigns and educational initiatives will promote the benefits of non-invasive breath analysis. Strategic partnerships with industry leaders and research institutions will drive innovation and growth, solidifying our position as a leader in breath analysis technology and making a significant impact on global healthcare,” she said.

It has been a long road for Jilma and Suman. Starting with the idea of a non-invasive diagnostic test to zeroing in on breast cancer, doing surveys, analysing thousands of volatile organic compound in breath facility and developing a test sensitive enough to detect one part per billion is no mean feat.

But more than that will be the possibility of thousands of women who either cannot reach a mammography centre, even a doctor and suffer the results of ignoring it. But if CanScan’s plans work, we will have the good chance to beat the dreaded breast cancer that takes away the lives of thousands of women every year.