

Researchers harnessing ‘nature’s pharmacy’ to tackle cancer

Many cancer drugs, antibiotics originate from a chemical compound in a natural product

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Local researchers are investigating tropical plants commonly consumed by cancer patients for their purported anti-cancer properties to see if they can be used in the management or treatment of certain cancers.

They are starting with the bandicoot berry, Sabah snake grass and moringa, which they have already sequenced, along with 97 other plant species from the region.

These plants are all found in the genomic garden at the Singapore General Hospital (SGH), which was set up by the SingHealth Duke-NUS Institute of Biodiversity Medicine (BD-Med) for genomic research and conservation purposes.

The three plants are being screened against approximately 10 different cancer cell lines, including breast, colorectal, lung, liver and kidney cancers, to validate the response. A cancer cell line is a culture of cancer cells that are grown indefinitely in a laboratory setting, serving as a model for scientists to study cancer biology and test potential treatments.

The researchers from BD-Med want to look at the mechanism by which the plants exert the observed anti-cancer effects.

Knowing how that works will allow them to translate research findings into effective therapies, its director Teh Bin Tean told *The Straits Times* during a recent tour of the garden.

“Each of these plants contains hundreds of plant chemicals, but no one has identified the specific chemical that has the anti-cancer effect. Once we identify this chemical X, we can test it on animals and then humans,” he said.

This is, however, a long and complex process. The research is still in its early stages, and it may take five to six years before any findings can progress to clinical trials and be translated to the bedside, he said.

In 2024, BD-Med started to explore the use of artificial intelligence to facilitate the process of finding chemical X in the plants to

see if it could help to quicken it.

BD-Med was launched in 2021 to focus on leveraging biodiversity to advance health and medicine. This involves studying local and regional biodiversity, particularly plants – from their genetic make-up to nutritional and medicinal value – and applying these insights in medicine, such as cancer treatment, and also for health and food security.

Natural products have shown great promise in drug discovery. More than half of all cancer drugs and antibiotics are estimated to have originated from a chemical compound found in a natural product.

At BD-Med, plant bioinformatician Abner Lim said that their research list includes plants that some patients at the National Cancer Centre Singapore were consuming.

The three plants that the institute is now studying at length have been the subject of research, but Professor Teh said BD-Med’s studies go beyond cataloguing claims to rigorously validate them.

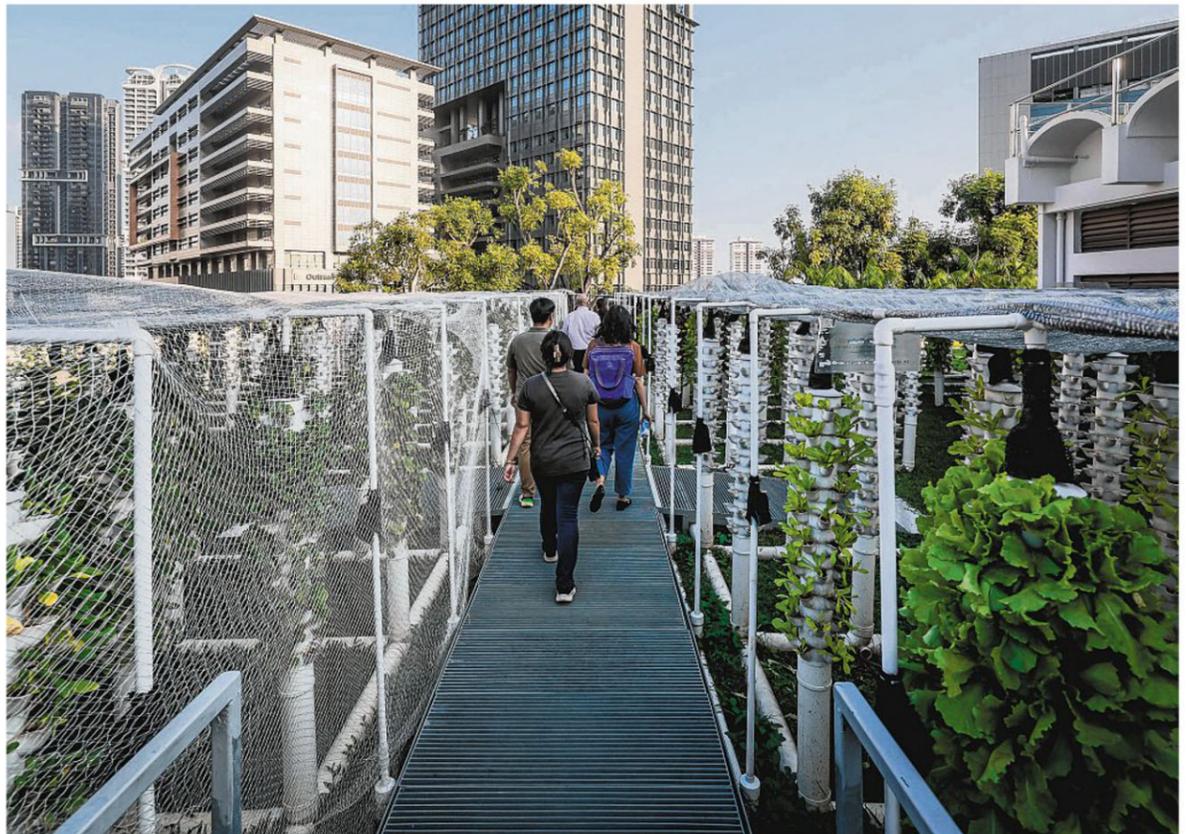
In 2018, a separate team of researchers, led by Associate Professor Koh Hwee Ling at the National University of Singapore, published their findings on seven plants commonly believed to be effective in treating or preventing cancer.

Among the seven, they found that extracts from the leaves of a large shrub, the bandicoot berry, also known as *Leea indica* or Huo Tong Shu in Chinese, can inhibit the growth of the majority of the 12 cancer cell lines that they were screened against.

After that study, Prof Koh said they zoomed into how *Leea indica* works for ovarian cancer cell lines and found that it has immunostimulatory effects and may even enhance the effectiveness of certain cancer treatments, so that less of an anti-cancer drug is needed to achieve the same effects.

Prof Koh said she is now collaborating with Prof Teh and his team on one study on how the leaf extracts of *Leea indica* can kill the cells in bile duct cancer.

She is also working with a private



SingHealth Duke-NUS Institute of Biodiversity Medicine’s (BD-Med) aquaponics farm, which combines aquaculture and hydroponics, on the rooftop of Singapore General Hospital (SGH). Here, researchers study the nutritional properties of the vegetables to understand the health impact on patients. ST PHOTOS: GAVIN FOO



BD-Med director Teh Bin Tean with his *Leea indica* plant, also known as bandicoot berry, at SGH’s rooftop garden. Prof Teh and some researchers are studying how the leaf extracts of *Leea indica* can kill the cells in bile duct cancer. The shrub is one of some 100 plant species from the region being studied for anti-cancer properties.

terol levels and blood sugar. They are now analysing the results and aiming to publish the findings in 2026.

“Durian is one example... We eat papayas, watermelons, mangoes almost regularly, but we don’t know how good they are, or how bad they are,” said Prof Teh.

BD-Med is also studying the genes and DNA of several species of vegetables, bred from seeds that were sent into space in 2024 to induce DNA mutations that make them a lot more resilient to diseases and harsher climates.

These include the amaranth, chye sim, xiao bai cai and kai lan. Starting with the amaranth, BD-Med aims to grow the vegetables in the lab under low light to identify traits that improve plant growth under low light conditions. This will be beneficial for indoor farming, which would otherwise require a lot of electricity to generate light.

Once the ideal crop is found, the space-mutated species could first be grown in the aquaponics farm, Prof Teh said. He anticipates that it may take three to four years before results can be seen.

BD-Med, he said, is expanding its presence with new gardens in other hospitals, starting with an aquaponic farm and a genomic garden at Sengkang General Hospital, and following that, at the upcoming Eastern General Hospital in Bedok North.

Prof Teh said BD-Med targets to sequence a total of 1,000 species of plants found in South-east Asia within the next few years.

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sector firm to study the effects of a supplement meant for breast cancer nutrition, when *Leea indica* is added to the proprietary blend of herbs used in it.

Meanwhile, BD-Med is conducting a trial on the use of essential oils from scented plants for therapeutic purposes, such as managing anxiety, in breast cancer patients undergoing radiotherapy.

While these studies are going on, the institute is also applying its expertise on agriculture, to look into “food as medicine” as well as to boost food security. It has an aquaponics farm, which combines aquaculture (fish farming) and hydroponics (soil-less plant cultivation), situated on the former heli-

copter pad of SGH.

In an aquaponics system, fish waste provides nutrients for plant growth, and the plants, in turn, filter the water for the fish, creating a closed-loop ecosystem. This reduces water usage and eliminates the need for chemical fertilisers.

Currently, the vegetables grown there, including xiao bai cai, kangkung, kai lan, red oak lettuce, romaine lettuce, Siberian kale and nai bai, are distributed to staff.

Plans to increase production are in place, once it secures a farm licence that will allow it to supply vegetables to SGH’s central kitchen, Prof Teh said.

Unlike the farms located at other hospitals, BD-Med’s farm is first

and foremost a “research” farm, where researchers can study the nutritional properties of the vegetables to understand the health impact on different groups of patients, he said.

This is the precision health approach, which involves tailoring food choices to a patient’s specific condition, microbiome, and metabolic responses, added Prof Teh.

“We want to look at which types of vegetables would most benefit patients with different conditions, like diabetes or cancer,” he said.

Durian is the subject of the institute’s first food nutrition research study, where they are looking at how the fruit impacts a healthy person’s health, such as his choles-