



# A FOCUS ON DIVERSE DISCIPLINES YIELDS RESULTS FROM CANCER TO COVID-19

THE CHINESE UNIVERSITY OF HONG KONG is a world leader in genomics, microbiome research and precision medicine.

**Medical researchers at The Chinese University of Hong Kong (CUHK)** are making headway across diverse fields, from the gut microbiome to lung cancer as well as exploring new frontiers in epigenetics.

For example, Francis Chan and Siew Ng lead a team researching the gut microbiome. Their group has developed the first and most comprehensive fecal microbiota transplantation (FMT) programme in Asia. This involves extracting healthy microbiome and transferring the 'good' microbes into people who are ill.

## HARVESTING THE GUT MICROBIOTA TO BOOST IMMUNITY

Since their FMT research began in the early 2010s, Chan and Ng have introduced to Hong Kong the technology with in-house proprietary algorithms for donor selection, which aims to cure life

threatening gut disorders using a personalised approach.

"We have identified unique compositions of the gut microbiota that are related to health conditions by analysing the DNA of fecal microbiota," says Chan. "The fecal microbiome could serve as markers for disease prediction."

During the pandemic, Chan and Ng were the first, in 2020<sup>1</sup>, to report that COVID-19 patients had an imbalanced gut microbiome, which was associated with immune dysfunction and more severe incidence of the disease.

In 2022, they reported a pilot study that showed a microbiome immunity formula can hasten recovery and boost antibody formation in patients with COVID-19 by restoring the gut microbiome. "Restoring the gut microbiome has potential in the treatment and prevention of long-term complications,"

explains Ng. The team has developed a novel microbiome immunity formula for clinical use in Hong Kong and South-East Asia.

The Microbiota I-Center (MagIC), established by Chan and Ng in 2020, focuses on harnessing and translating human gut microbiome into novel innovations for early disease detection and prevention. Its centralised microbiota stool bank aims to provide safe FMT preparations for clinical and research use.

## TARGETED LUNG CANCER THERAPY

Another CUHK team, led by Tony Mok, is investigating disease prevention and intervention, in this case, offering fresh hope to lung cancer sufferers.

Mok and his Asia Thoracic Oncology Research Group have decoded commonly mutated genes in lung cancer and

developed targeted therapies, including immunotherapy, that have extended patients' lives.

Until about two decades ago, targeted medication was not a possibility for patients with advanced lung cancer. But now, says Mok, "almost all patients can receive targeted therapies or immunotherapy after being screened for the mutated genes and biomarkers."

For years, he and his team researched patients with epidermal growth factor receptor (EGFR) mutations. This condition can activate human body cells to divide and grow out of control, forming tumours. To tackle this issue, Mok led a study<sup>2</sup> that identified a targeted inhibitor that effectively controls the growth of EGFR cancer cells.

Over a decade ago, Mok and his team developed a molecular targeted therapy<sup>2</sup> for lung cancer patients with

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EGFR mutation whose tumours had acquired resistance to first-line targeted therapy. This treatment provides a new line of defence that stops the disease from worsening," he claims. The discovery helped the development of personalised targeted therapy.

Mok is also engaged in immunotherapy research and has demonstrated that immunotherapy is an effective treatment for some lung cancer patients<sup>2</sup>. Future research will focus on the efficacy of different drugs in immunotherapy, the application of antibody-drug conjugates on lung cancer and the development of vaccines for lung cancer.

## LIQUID BIOPSY DETECTS CANCER

Tackling cancer from a different angle, researchers led by Dennis Lo, are using a liquid biopsy to detect many types of cancer, including nasopharyngeal cancer, at a much earlier stage than previously possible. Lo developed the liquid biopsy or plasma DNA testing technique as a method for prenatal diagnosis,<sup>3</sup> and now this general approach is widely used to

provide diagnostic information without invasive tissue sampling across many clinical conditions.

According to Lo, 76% of nasopharyngeal cancer patients in Hong Kong have entered the third or fourth stage by the time they are diagnosed. "Our liquid biopsy technology can help most patients to detect the cancer much earlier to improve survival," he says.

Plasma DNA testing has a huge range of potential applications, but it still has limitations. For example, other methods are needed for differentiating DNA derived from different tissues within the body, where gene sequences are identical.

Lo and his team have developed a technique that can directly detect epigenetic variations using a single molecule sequencer. "Unlike conventional chemical techniques which damage 90% of the DNA, the new technique achieves 90% detection accuracy while being able to analyse a long DNA molecule," he says.

Lo describes how the team spirit and research environment at CUHK provide the perfect

soil for innovation. CUHK also promotes collaboration among business, academic and research sectors, attracting potential investors, catalysing technology transfer and realising impact.

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The university also fosters entrepreneurship. "CUHK encourages scientists and researchers to establish companies as a means to translate their research into applications," says Lo. "It means we can obtain more resources and flexibility: we can take bold steps and explore new horizons." ■

▲ (Images from left to right) Siew Ng and Francis Chan lead the team that developed a leading program in fecal microbiota transplantation. Fecal transplants involve extracting and transferring the 'good' microbes into people who are ill.

Tony Mok's work includes clinical research on oncogene driven lung cancer and the application of immunotherapy. Mok and his team helped the development of personalised targeted therapy when they developed a molecular targeted therapy for lung cancer patients with EGFR mutations.

Dennis Lo's liquid biopsy technology can detect cancer-associated mutations and other alterations in blood through genome-wide DNA sequencing. Fetal DNA is present in maternal blood and Lo has shown it can be used for prenatal testing.

## REFERENCES

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