

# Scientists identify lung cancer stem cells and new drug targets

January 6 2012

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Singapore scientists, headed by Dr. Bing Lim, Associate Director of Cancer Stem Cell Biology at the Genome Institute of Singapore (GIS), a research institute under the umbrella of the Agency for Science, Technology and Research (A\*STAR), and Dr Elaine Lim, medical oncologist affiliated with Tan Tock Seng Hospital (TTSH) and National Cancer Centre Singapore (NCCS), have, for the first time, identified a gene responsible for lung cancer. The finding, reported in the advanced online issue of *Cell* on 5 January 2012, is a huge step towards finding a cure for the disease.

A small number of cells, known as cancer [stem cells](#) or tumor-initiating cells (TIC), are responsible for the promotion of [tumor growth](#). Dr. Bing Lim's team was successful in finding a marker, known as CD166, to identify these cells. With the finding of this marker, the team then made more inroads into the genomic study of the TICs, and discovered several genes that were important for the growth of cancer cells.

The metabolic enzyme known as glycine decarboxylase (GLDC) is a normal occurring enzyme in cells, present in small quantities. The scientists discovered that in abnormal instances when the level of GLDC rises significantly, it causes changes in the behavior of the cell, making it cancerous.

"The manuscript from Dr. Bing Lim's laboratory provides a very exciting breakthrough about the unique metabolism of tumor initiating cells" said Dr. Lewis Cantley of Harvard Medical School. "This study builds on

recent observations that a subset of cancer cells have enhanced serine/glycine metabolism. Importantly it shows that the enzyme glycine decarboxylase, which contributes to nucleotide synthesis, is elevated in lung tumor initiating cells and that it is critical for the ability of these [cells](#) to form tumors in vivo. Since glycine decarboxylase does not appear to be generally required for the growth of normal adult tissues, these results raise the possibility that this enzyme could be a target for cancer therapy."

"This research is exemplary of the synergy between cancer researchers and clinicians that led to a breakthrough in our understanding of the metabolic pathway in lung cancer. I congratulate Dr. Bing Lim and Dr. Elaine Lim for leading this impressive multi-institutional study," said Dr. Huck Hui Ng, Acting Executive Director of GIS. "The discovery of the biomarker has profound implications in cancer diagnostics and stratified medicine. It is hopeful that the metabolic enzyme GLDC will be a good target for drug development by the pharmaceutical industries."

Dr. Bing Lim added "This is one of the most satisfying pieces of work I have orchestrated and the biggest credit must go to my post doctoral fellow, Dr. Wen Cai Zhang, who took the project from first establishing a xenograft model for human lung cancer to the identification of CD166 as a marker for lung cancer stem cell and culminating with the amazing discovery of the impact of a regular metabolic enzyme in carcinogenesis. It is doubly satisfying that we may have also identified a major drug target for controlling cancers".

Dr. John Wong, Vice Provost (Academic Medicine) of the National University of Singapore, explained that "Lung cancer is one of the most common causes of cancer death in Singapore and the region. There is an urgent need to better understand what drives this disease, especially as lung cancer in Asians appears to have major biological differences compared to that commonly seen in the West. The authors of this

seminal paper should be congratulated as they represent the best of Team Science in Singapore, comprising both basic scientists and clinician investigators, all working to develop better therapies for Singaporeans and the community we live in. The findings from Dr. Bing Lim's team strongly support the cancer stem cell paradigm and similar studies in other cancers need to be done.”

Elaine Lim, co-corresponding author and co-principal investigator in this project said, “This paper is the result of successful co-operation between scientists and doctors from the Singapore Lung Cancer Consortium, with the Stem Cell division in GIS. The thoracic surgeons from TTSH, NCCS and NUHS have made outstanding contributions to this homegrown scientific project”

Prof Soo Khee Chee, Director of NCCS, said that “NCCS has made important contributions to medical research through the years, both in clinical as well as basic research. This paper is an example of a very satisfying outcome when medical doctors and scientists huddle together to produce high-quality work. Co-operation between seemingly disparate disciplines amongst the different institutions in Singapore, led by Elaine and Bing, was critical to this success – and there will be many more to come”

“This study has made significant contributions to our fundamental understanding of [lung cancer](#),” added Prof Philip Choo, Chief Executive Officer at TTSH. “The study also represents an exceptional step forward for medical research involving doctors and scientists. We look forward to more of such collaborative efforts in the future.”

**More information:** The research findings described in the press release can be found in the 5 January 2011 advanced online issue of *Cell* under the title “Glycine Decarboxylase Activity Drives Non-Small Cell Lung Cancer Tumor- Initiating Cells and Tumorigenesis”.

Provided by Agency for Science Technology and Research (A\*STAR)

Citation: Scientists identify lung cancer stem cells and new drug targets (2012, January 6)  
retrieved 23 April 2024 from

<https://medicalxpress.com/news/2012-01-scientists-lung-cancer-stem-cells.html>

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