Scientists create a complete atlas of lung tumor cells

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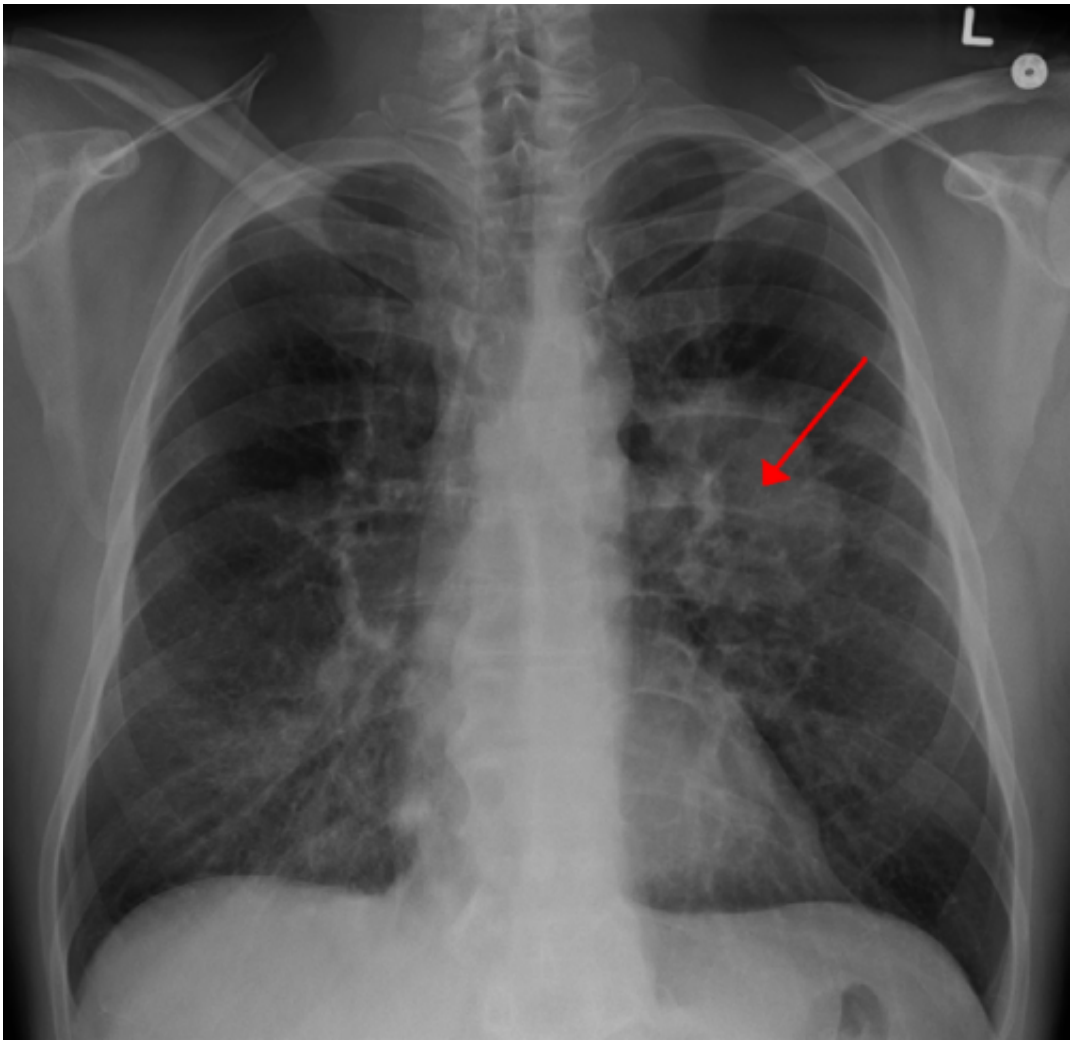

Lung CA seen on CXR. Credit: CC BY-SA 4.0 James Heilman, MD/Wikipedia

Researchers from VIB, Leuven University and University Hospital Leuven studied thousands of healthy and cancerous lung cells to create the first comprehensive atlas of lung tumor cells. Their results reveal that tumors are much more complex than previously appreciated, distinguishing 52 different types of cells. This new information can be used to identify new research lines for treatment. The results of the study will be published in the leading journal *Nature Medicine*.

While scientists have made enormous headway in the fight against cancer, scientific understanding of tumors at the cellular level has been relatively limited. With the advent of new technologies such as single-cell sequencing, big data analytics and advanced bioinformatics pipelines, it is now possible to examine individual cells within their microenvironments at high resolution, for rich insights into their phenotypes.

Tumors found to be unexpectedly more complex

Tumors are very complex ecosystems of cells that interact with their native environments. Studying them in detail requires technologies that have only recently become accessible. The researchers used single-cell RNAseq technology to study almost 100,000 individual cells, focusing on both cancerous cells and non-cancerous cells in tumors such as blood vessels, immune cells and fibrous cells to create the very first atlas of cell phenotypes found in lung tumors.

Prof. Diether Lambrechts (VIB-KU Leuven): "We were surprised to discover that there are actually many more cell types in lung tumors than expected. We identified 52 different types of cells, versus the dozen cells already known to be present. This indicates that tumors are even more complex than we had realized."

The importance of studying cells within their natural environments

Many of the cells in tumors have never before been characterized in their native environments. Because the team analyzed both tumor cells and lung cells found outside the tumor and compared the two, they were moreover able to observe how each cell type is altered by the tumor.

Prof. Bernard Thienpont (KU Leuven): "The comprehensive tumor cell atlas that we developed provides a benchmark for cell types that, up to this point, have typically only been studied in-depth in vitro or in animal models. For the first time, we are capable of seeing to what extent these models reflect the actual situation in patients.

"With these results, we've also opened up numerous avenues for future research. Do our findings hold true in other tumor types? How are these cells affected by therapy, and how do they develop resistance? What are the physical locations of these cell types in tumors and can we put together a cellular building plan for tumors? How do tumors produce and support this remarkable complexity, and can we develop therapies that take advantage of tumor-specific vulnerabilities? All of these questions are now ripe for exploration."

Dr. Els Wauters (Leuven University Hospitals) adds: "The new information that we've gathered will be used to develop new strategies to fight the formation of blood vessels in tumors and to test new potential targets for immunotherapy. In addition, we also demonstrated that the presence of some types of cells is associated with lower patient survival, further emphasizing the clinical importance of our findings."

More information: Phenotype molding of stromal cells in the lung tumor microenvironment , *Nature Medicine* (2018). DOI:

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