Transcript Details

This is a transcript of an educational program. Details about the program and additional media formats for the program are accessible by visiting: https://reachmd.com/programs/project-oncology/unlocking-tumor-complexity-single-cell-rna-sequencing-in-lung-cancer/36553/

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Unlocking Tumor Complexity: Single-Cell RNA Sequencing in Lung Cancer

Announcer:
You're listening to *Project Oncology* on ReachMD. On this episode, Dr. Paola Marignani will discuss how small-cell RNA sequencing and machine learning are advancing lung cancer care, which she spoke about at the 2025 World Conference on Lung Cancer. Dr. Marignani is a Professor in the Department of Biochemistry and Molecular Biology at Dalhousie University in Halifax, Nova Scotia. Let's hear from her now.

Dr. Marignani:
So single-cell RNA sequencing analysis of primary lung cancers provides a level of granularity that traditional next-generation sequencing has not provided. Specifically, it gives us a great deal of information about tumor heterogeneity because this technology gives us information about the diverse cell population within a tumor.

So unlike traditional bulk RNA sequencing where a primary tumor is taken from a patient, then it is basically grounded up and then it's prepared for sequencing, when you do that, even though it's made up of all these different types of cells, we really don't know the complexity of that tumor. We do get information about the genetic material. That is traditional next-generation sequencing.

Single-cell RNA sequencing allows us to take that same patient tumor, dissociate all the different cell types within that tumor, and then conduct next-generation sequencing on all the individual cells within that tumor. So the level of information we gain from single-cell RNA sequencing is in the terabytes of information that we can then interrogate using technologies like artificial intelligence and machine learning.

And so the elegance of single-cell RNA seq is we get tumor heterogeneity. So we get information about all the diverse cells that are found within a patient's tumor, and then we also get a very detailed information about the genetic diversity within each of the different cell types. We get information about the differentially expressed genes—not for just the entire tumor, but every single cell.

Machine learning allows us to take all this information and simultaneously tease through terabytes of information about a patient's cancer and identify the unique characteristics at the genetic level. It allows us to identify splice variants, different type of mutations, and single nucleotide variants.

Traditionally, we could do this bioinformatics, but this could take a year to two years to go through ten patient tumors. With single-cell RNA seq, we can go through 500,000 individual tumor cells from those same ten patients, and with this large language modeling and all the different types of machine learning that we can apply, we're able to get significantly more information in a shorter time frame, and we can do it simultaneously.

The other part of machine learning is it allows us to create algorithms for predictive modeling. So we're at a point where we can predict which lung cancer patient may have recurrence or resistance long before they even begin their treatments because we're fortunate enough to have one of the largest lung tumor banks in Canada. We have more than 8,000 patient tumors, and I'm the scientific director for our QEII Lung Tumor Bank. And with that, we have all this information about the patients, and we're able to go in and take all these tumors and do this massive analysis and determine which patient is likely to recur, which patient is likely to be responsive, and for which patient the most classic drug that's used to treat an EGFR mutation may not work. So machine learning has allowed us to identify or create these algorithms for predictive modeling.

Announcer:

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That was Dr. Paola Marignani discussing the integration of small-cell RNA sequencing and machine learning into lung cancer management, a topic she presented on at the 2025 World Conference on Lung Cancer. To access this and other episodes in our series, visit *Project Oncology* on ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening!

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