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Current & Future Innovations in Lung Cancer Detection

Announcer
You're listening to Closing the Gaps in Non-Small Cell Lung Cancer on ReachMD, sponsored by Lilly. Here's your host, Dr. Paul Doghramji.

Dr. Doghramji:
Despite exceptional therapeutic advancements for patients with non-small cell lung cancer over the past several years, a 5-year survival rate of only 19% makes this one of the most persistently daunting cancers to treat. One of the biggest blind spots for us is not knowing whose disease is going to metastasize quickly and who by extension would benefit from the most aggressive treatments up front. But the entrance of better detection methods such as biomarkers and assay tests could change all of that. So, how do we get there? And what lies ahead? That's coming up in today's program.

Welcome to Closing the Gaps in Non-Small Cell Lung Cancer on ReachMD. I'm Dr. Paul Doghramji, and here to help us look at current and future innovations in lung cancer detection is Dr. Tony Hu, Professor and Weatherhead Presidential Chair in Biotechnology Innovation at Tulane University Medical School.

Welcome to you, Dr. Hu.

Dr. Hu:
Hi, glad to be here.

Dr. Doghramji:
To catch our audience up on your current work, you coauthored a recent study investigating a potential serum biomarker for early identification of metastatic disease, and it's gotten a lot of attention for its potential to put biomarkers on the same sentence as lung cancer. So, Dr. Hu, can you walk us through the development and the work that went into this study?

Dr. Hu:
Where the motivation comes from for this study really comes from my personal experience and because lung cancer is the number one cancer in the world, and every year many, many people died, are lost by this very aggressive cancers. Several very close cousins died by lung cancers, and so I actually experienced the whole procedures and how they were diagnosed and someone was diagnosed at the late stage, and before that they didn't feel very much, and so, once they were diagnosed, they had been stage IV. And also, for example, like my uncle, he was very healthy, and when he was diagnosed, it was in the middle stage, and the doctor said, "Well, based on the current diagnosis, it looks like it's very mild," but up to half of year it become very aggressive. So, this is really painful for many people.

When I met my coauthors, the collaborator, Dr. Zhongxing Liao from MD Anderson Cancer Center, we realized she has very organized, well-organized clinical cohorts for us to further the study if there is any effective biomarkers for us to predict the cancer metastasis in the patients, so that's how we started this project.

Dr. Doghramji:
Very interesting. So, can you speak to this journey, Dr. Hu, towards identifying biomarkers for such an aggressive disease and how your background as well as those of your colleagues helped advance the cause?

Dr. Hu:

Well, my background is pretty similar as many other scientists. I was trained in the biomedical engineering and then was starting biomarker discovery based on the nanotechnology, so many other people were working on the same field, and we respect each other. If you really like to know what's the difference between our research and others, I think I would say we really like to focus on the biomarker which can provide the very strong diagnostic power. There's many, many biomarkers bases in the field. For example, circulating tumor cells, circulating tumor DNA were cancer antigens, so why we don't have very robust cancer diagnostic assays so far is because those biomarkers—generally they're in the very low concentration. For example, like the cancer circulating tumor cell, and probably in the milliliters of blot, you can detect a single digit of cells, so the low concentration of those biomarkers will result in the false-positive and false-negative issues. Then we actually focused on the extracellular vesicle because we believe if we have tubes to detect the tumor-derived or tumor-specific, the extracellular vesicle, and based on the amount of the vesicles in the teeny, tiny amount of a blot, we can really offer the stronger diagnostic power. For example, every single tumor cell can secrete 10,000 vesicles every day, and in 1 µl of plasma or serum, you can detect 107 power vesicle. So again, if you have the way to specifically capture the tumor-specific extracellular vesicles and the diagnostic power, this assay should be much greater than others.

Dr. Doghramji:
Let me track back to a basic question for you. Why has it been so hard to pinpoint biomarkers or any other means of detecting patients with the most aggressive lung cancer types early on?

Dr. Hu:
Well, that's a really good question, and that's why we want to trigger the blot-based biomarker discovery. And you know right now the most diagnostic measure for lung cancer or gold standard, they rely on the invasive measure to confirm the patients who have the lung cancer, so imaging technologies or the tissue slide. It's not always available, and so, if a patient really doesn't feel any strong symptoms, they won't do this because it's very expensive and time-consuming. So, if you have the blot test, and it could be handled pretty easily, it can quickly give the patients some feedback, so that will be very ideal. So we have a lot of the cancer screening tests based on the blot test, but those markers, there is not much specificity, and sometimes, as I mentioned, for your last question if the biomarker is in the very low concentration, they won't be very sensitive either, so we really need a biomarker with the confirmative message and also at a little bit higher amount for us to capture. Then we can offer the strategy for early detection.

Dr. Doghramji:
For those just tuning in, you're listening to Closing the Gaps in Non-Small Cell Lung Cancer on ReachMD. I'm Dr. Paul Doghramji, and today I'm speaking with Dr. Tony Hu, senior author of a study examining a potential biomarker for early identification of metastatic lung cancer.

So, Dr. Hu, we alluded to there being various ways in which lung cancers could be detected earlier. From your vantage point in the biotechnology field, what research avenues are you most excited about these days?

Dr. Hu:
Well, many things, because many things have happened, right? So back to 10 years ago when the people first heard the personalized diagnosis, we were pretty excited, but with the development of multiple technologies, right now we have more options to conduct the personalized diagnosis research. And so, at the NCI, the sponsored network which is called the Early Detection Research Network, there is many teams that make the joint effort in providing the personalized diagnostic solutions, and so later on, based on the different biomarkers contributed, probably including ours, and then the doctors can offer the more specific or more personalized solutions for each patients. That will be pretty ideal for the cancer management.

And talking about others, I think the AI that's another very exciting field for diagnosis, and we also need more materials to help the detection assay like the panel materials and others and for the therapy—of course, the immunotherapy, the great development recently, especially for lung cancer, but we still have something to address the side effects, how to evaluate or how to do the risk assessment for those side effects triggered by the immunotherapy. That could be the next target for us.

Dr. Doghramji:
What are you seeing from other clinical- or laboratory-based fields for research that holds a lot of potential to improve early detection of lung cancers?

Dr. Hu:
Many groups working on the next-generation sequencing and AI, also the breakthrough discovery in the imaging technologies, and all of them are contributing for the personalized diagnosis. And lung cancer, based on their natures, it could be quite different between each individual, and so such multiple or multidisciplinary effort can definitely push forward the personalized diagnosis of lung cancer.

Dr. Doghramji:

So, do you think it's going to take a long time before these different avenues of bench research make it to the bedside, or are we actually close to a major change in the way we go about detecting lung cancer?

Dr. Hu:
This is a really good question, and I think that really depends on how scientists design research at the very beginning. If the scientists have the training or have the common sense about how FDA approved your detection assay for the clinical application, the pipeline could be much shorter, but if we only focus on, okay, we want to increase the sensitivity and the specificity and that's it without thinking about the requirement from FDA, this way could be longer, so it's very necessary for the research scientists to understand how FDA or how even the clinical trial handled your detection assay in the disease diagnosis.

But for us, and because the technology was designed to profile extracellular vesicles, that's really considered how to minimize the variation between persons, between the different locations, and how the temperature affect the operations, and the sample will be significantly influenced by transportation conditions, so we considered this very well. So, when delivered the technology and the profiling of those vesicles of assay, it's pretty robust and reproducible. That's actually highly required by the clinical conditions. This study for this project definitely were aiming to push forward to the clinical applications through the startup company commercialization.

Dr. Doghramji:
What do you see as the next priorities for the biotech research and industry sectors to most effectively move the needle on survival rates for patients with non-small cell lung cancer?

Dr. Hu:
Well, there are so many needs in this field, right? There's a lot of things we haven't addressed yet. I think the commercialization or the industry should focus on collaborating with not only the research scientists and also the public health researchers because the scientists in the public health field can better understand how the human living behavior affect the spread-out of this disease, and also, the commercialized industry should also focus on producing a more convenient kit for people to screen themselves, so that would do a better job in controlling the disease.

Dr. Doghramji:
So, Dr. Hu, before we wrap, do you have any other thoughts you'd like our audience to take away from your topic today?

Dr. Hu:
Well, I would say that for not only for cancer, lung cancer, breast cancer, pancreatic cancer, and also for other infectious disease, we need a lot of effort, not only from the scientists, also from the industries, from the clinics and also from the government—but right now for the biomedical field, and I think the joint effort is still not enough, especially the international effort. So, I really urge all people from any field have an open mind for the scientific collaborations. It's very necessary to keep fighting with the different type of pathogens.

Dr. Doghramji:
Well, with those parting comments, I want to thank my guest, Dr. Tony Hu, for walking us through some current and future innovations in lung cancer detection. It was great having you on the program, Dr. Hu.

Dr. Hu:
Thank you so much.

Announcer
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