[music]

Richard Head: My name is Richard Head. I am a professor of genetics and pathology and immunology here at Washington University School of Medicine.

Here at the GTAC, we are what's known as the genomics core facility, and we measure everything from sequence to human genomes. We do transcriptomics, proteomics, and we do a great deal of bioinformatics that allows us to analyze these data and help researchers understand and interpret them.

Many diseases, especially adult diseases, are the result of the interaction between environmental and lifestyle factors with the genome, so the genome is really just a component. And there's a lot of other things that we need to measure in order to truly understand the nature of these diseases and how they differ from person to person.

Driving Precision Medicine Initiatives
Thankfully, with the advance of a lot of technologies, we now have a lot of tools available to us to really help drive the precision medicine initiatives.

Proteomics in particular allows us to identify proteins that are in circulation or in other biofluids that we could not necessarily measure at the transcript level unless we had biopsies from the disease site.

An example of this is cerebral spinal fluid. You can measure proteins from CSF that otherwise you would only be able to get from the brain. And typically, you can only get brain tissue post-mortem.

These are just areas where the ability to screen for these entities in a meaningful way and measure them is really advancing our understanding of these diseases.

[music]

Advancing Our Understanding of Diseases
Human disease is immensely complex. Often, it occurs over years or decades of progression, and the way it occurs in one person can be very different from another.

It's really critical that we have these types of screening technologies available to us in order to be able to discover what we didn't know, and it turns out what we didn't know for many of these diseases was vast.

The biggest risk we face is simply not being able to measure things that are important in understanding the human disease to really have an understanding about a disease and its molecular underpinnings and potentially more importantly the subtypes within a disease. I need to be able to screen many people, but that's why it is so critical that we have these technologies in the research arena, in order to be able to build that

knowledge, to be able to understand those subtypes, and then be able to identify those critical biomarkers that could be used in the clinic later.

Doing Multi-omics on a Large Scale
We've gone from literally not being able to do these things to being able to do them rapidly and cost-effectively in such a short period of time. It's literally been almost like an overnight switch to where we've reached the point of we can now do multi-omics on a large scale and use this to advance medical research.

Today, the ability to measure molecular entities, such as proteins from blood or urine or other biofluids, is allowing us to potentially characterize individuals and the subtype of their disease or potentially even how they may respond to treatments down the road in a minimally invasive way without having to biopsy a kidney or take a sample from the bone or other things that in many cases, just if they're possible, you would really be very likely to only get a very small number of samples. In many cases, they're not possible.

Bringing Advanced Treatment into the Clinic
Now, the next stage of this will be for the companies and the centers that are involved in the development of treatments to utilize this information to bring more advanced treatments, more specific types of treatments into the clinic. From the laboratory perspective, that is what I'm most excited about.

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