Researcher watches the start of his own disease with unprecedented detail

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These days, most of us don't head to the doctor until we are already ill. What if you could see disease approaching just as it starts to head your way? A study in a special March 16th issue of *Cell* focused on human biology shows that this futuristic notion is already in reach. Scientists have combined a complete personal genome sequence with analyses of disease risks and an array of dynamic molecular measures, capturing important changes in the way the human body works. The study is the first to apply "integrative Personal Omics Profiling" (iPOP for short) to observe healthy and diseased states, the researchers say.

"Instead of following just a few tests, this study is the first to follow tens of thousands of components over a long period of time -- now two years," said Stanford University's Michael Snyder, who was both the subject of the study and its lead researcher. " This allowed the following of health and disease states at an unprecedented level."

This pilot personalized medicine study appears alongside a series of reviews on emerging themes in human disease, which will be freely available online from Cell Press for the next month.

The research team first determined Snyder's complete genome sequence at high accuracy and then used it to determine his risks for disease. That analysis showed significantly elevated risks for basal cell carcinoma, high triglycerides, and Type 2 diabetes.

Based on those predictors, the team looked at a variety of molecular

markers. One particular finding was that initially normal blood sugar levels rose shortly after Snyder was infected with RSV, a virus that often leads to bronchitis and other respiratory illnesses. The increase in blood sugar was sustained, similar to increases in blood sugar that are associated with the onset of type II diabetes. With dramatic changes in diet, exercise and a regular low dose of aspirin, his glucose levels dropped back down.

"By following markers for the disease as the person (me) came down with it -- it was caught early and managed," Snyder said. " In the future this could become a critical part of health care where people have their genome sequenced and the information is used to monitor and manage their health."

Detailed profiles of RNA, protein and metabolites over the course of study, through two infections and the onset of diabetes, also revealed clear systemic responses to infection. Those shifts included changes in infection and stress response pathways and those related to high glucose.

The researchers also uncovered changes in the expression of some genes and unexpected RNA editing events during transitions from healthy to diseased states. They also note particular interest in a protein-level response related to the rise in glucose post-RSV infection. "It is tempting to speculate that the RSV infection and/or the associated event at day 12/18 triggered the onset of high glucose/Type 2 diabetes," they write. They suggest similar analyses of other individuals at risk of diabetes might be particularly informative about the events that tip the balance from health to disease.

Overall, the new study offers proof-of-principle that dynamic molecular-level changes observed over time can provide meaningful physiological and clinical information. The researchers say it may also be a great help in the design and application of personalized health monitoring,

diagnosis, prognosis and treatment.

More information: Chen et al.: "Personal Omics Profiling Reveals Dynamic Molecular and Medical Phenotypes."
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