

ABOUT THE REGENERON GENETICS CENTER AND GEISINGER HEALTH SYSTEM COLLABORATION



- ◉ The Regeneron Genetics Center (RGC) is a large-scale, fully integrated genomics program that builds on Regeneron's long-standing strength in genetics and related technologies.
- ◉ The RGC uses state-of-the-art automation and cloud-based informatics to sequence and analyze at a rate of 200,000 exomes per year.
- ◉ With Regeneron's integrated discovery-to-commercialization capabilities, RGC findings are being used to identify and validate drug targets and pharmacogenetic markers, and to obtain biologic insights into disease and disease mechanisms. This information feeds back into the ongoing work of many functional groups at Regeneron.

Geisinger

- ◉ Geisinger is one of the largest integrated health systems in the U.S. and a pioneer in the use of electronic health records (EHRs).
- ◉ It serves more than three million Pennsylvania residents, throughout 48 counties in central, south-central and northeast Pennsylvania, making it the largest rural health services organization in the country.
- ◉ The MyCode Community Health Initiative is a precision medicine project enrolling at Geisinger Health System locations in Pennsylvania and New Jersey. It includes a system-wide biobank designed to store blood and other samples along with their corresponding de-identified EHRs for research use in collaboration with the RGC.
- ◉ If collaboration results are validated by Geisinger in a CLIA-certified lab, clinicians can share genetic results and their potential impact with patient participants.

THE COLLABORATION

Together, the RGC and Geisinger teams plan to create one of the world's most comprehensive databases of paired exome sequences (genotypic) and real-world health records (phenotypic) information.

By analyzing this data and making associations between genes and disease, the goal of the collaboration is to make discoveries that inform and speed the drug development process and, ultimately, improve patient healthcare outcomes through the development of new therapeutics.

WHAT ARE WE FINDING?

To date, the RGC has sequenced genetic data from more than 90,000 Geisinger patient volunteers. From this data and data from other collaborators, we are exploring:

- ◉ New gene targets or biomarkers associated with disease → 100s of novel candidate gene targets found thus far
- ◉ Loss of function (LoF) variants that offer insights on a certain gene's role in health and disease → Predicted LoF variants have been identified for virtually all of Regeneron's target genes
- ◉ Ongoing use of human genetic findings to identify new targets and validate existing targets from Regeneron R&D and clinical programs

For the more than 160,000 MyCode participants, Geisinger aims to return actionable results that have been appropriately and independently verified in their labs. Results so far include:

400+

patient participants received genetic results as of September 2017

196

are at risk for hereditary breast and ovarian cancer

39

are at risk for early heart attacks and strokes

33

are at risk for early colon, uterine and other cancers

Results can drive preventative care measures

This collaboration also allows for the potential to do "call-back" studies, where the RGC and Geisinger can pursue clinical research on genes of interest and their impact on patient health and disease.



Barbara Barnes, 57
Hazleton, PA
MyCode Patient Participant

Barbara, a grandmother raising her three grandchildren, agreed to participate in the MyCode program after discussing it with her doctor. Her blood sample came back positive for the BRCA1 gene mutation, giving her a much higher lifetime risk of developing breast cancer and ovarian cancer. Her results prompted her to have preventive surgery to remove her ovaries and fallopian tubes, during which her doctors discovered cancer in one of her fallopian tubes. She credits her participation in MyCode for helping her discover and treat her cancer. "If I hadn't been in MyCode, I wouldn't have known," she says.

PROTECTING PATIENT PRIVACY

- ◉ Patient privacy and consent are extremely important to both the RGC and Geisinger.
- ◉ All participants have fully consented to providing their genetic information, and Geisinger de-identifies all health records.

For Geisinger, this relationship is about the potential to improve individualized patient care...we expect that many of our patients and their family members will directly benefit from their participation in this research.

DAVID H. LEDBETTER, PH.D.,
Executive Vice President and Chief Scientific Officer,
Geisinger Health System

The relationship with Geisinger is a cornerstone of the effort the Regeneron Genetics Center is building, which we believe can advance the goals of human genetics research and personalized medicine.

GEORGE D. YANCOPOULOS, M.D., PH.D.,
Chief Scientific Officer and President, Regeneron

Electronic medical records let doctors and researchers across the country collaborate more closely than ever before. More powerful computers help us analyze data faster than ever before. If we combine all these emerging technologies, if we focus them and make sure that the connections are made, then the possibility of discovering new cures, the possibility of applying medicines more efficiently and more effectively so that the success rates are higher, so that there's less waste in the system, which then means more resources to help more people—the possibilities are boundless. So the time is right to unleash a new wave of advances in this area, in precision medicine, just like we did with genetics 25 years ago.

FORMER PRESIDENT BARACK OBAMA