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Mayo Clinic launches whole genome breast cancer study

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The Breast Cancer Genome Guided Therapy Study (BEAUTY Project) will help physicians tailor chemotherapy to breast cancer patients based on their individual genomes and the genomes of their tumors. Mayo Clinic researchers will obtain three whole genome sequences: one from the patients' healthy cells before treatment, and two tumor genomes – one before chemotherapy and one after. Patients will be paired with mouse "avatars" that will help physicians identify the best treatment for each person.

"What is so exciting about this study is that it has the potential to really bring individualized medicine to our patients," says Matthew Goetz, M.D., Mayo oncologist and study co-leader. "It will transform how we conduct breast cancer research and how drug therapies are delivered to women with breast cancer."

In phase one of the BEAUTY Project, researchers will study the first 200 participants to look for common mutations that allow some tumors to adapt and thrive during chemotherapy. This information will help doctors identify new drugs and treatment strategies.

Women diagnosed with "high-risk" cancers who are scheduled to receive standard chemotherapy before surgery will have their healthy genome and their breast cancer tumor cells sequenced before treatment, and then receive the commonly prescribed chemotherapy to shrink the tumor. At surgery, the residual cancer tumor cells will be sequenced again to evaluate how they have mutated and adapted to chemotherapy.

In addition, patients' tumor tissue will be kept alive by implanting cell lines in immune-compromised mice -- before and after chemotherapy. The use of these mouse "avatars" will let researchers study the effects of chemotherapy on individual patient tumors and identify the best treatment, without risk of harm to the patient.

"Patients are pleased after definitive breast surgery to be cancer free," says Judy Boughey, M.D., a Mayo breast surgeon and study co-leader. "Unfortunately, a subset of high-risk patients still may experience recurrence, even months or years later. We designed this study to give those patients hope that our ability to decode the genome of every patient might give us new tools to treat cancer."

Oncologists, surgeons, radiologists, and genomics and cancer researchers will work together to uncover the clues to effective individualized therapies and drug discovery. The BEAUTY Project is being funded by benefactors and the Mayo Clinic Center for Individualized Medicine, in collaboration with the Mayo Clinic Cancer Center.

"We are living in an era that I never thought I'd see during my career -- when we can sequence, in real time, the entire genome of a patient and her tumor and use that information to tailor treatment to the individual patient," says Richard Weinshilboum, M.D., director of the Pharmacogenomics Program in the Mayo Clinic Center for Individualized Medicine.

Together, the whole-genome sequencing data and transplanted cell lines are used to identify the gene pathways that influence individual patients' responses to chemotherapy. Armed with this deeper understanding of the genomics of cancer, doctors will be able to optimize treatment plans for individual patients.

This approach, called pharmacogenomics, is part of an ongoing effort at

Mayo Clinic to personalize medicine for every patient and will help doctors prescribe the right drug for the right patient at the right dose and time. Additional work is being done in the Center for Individualized Medicine to develop clinical decision support tools to help doctors prescribe the best medication for each patient based on the latest pharmacogenomic knowledge.

Though initially being applied to breast cancer, this approach will be used in the future to study the treatment of many other types of cancer.

Provided by Mayo Clinic

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