Charles Perou, Ph.D.
2016 Susan G. Komen®
Brinker Award for Scientific Distinction in Basic Science

Charles Perou, Ph.D., is being honored for his significant contributions to breast cancer research, including the characterization of the diversity of breast tumors, which demonstrated that breast cancers can be classified into at least five intrinsic molecular subtypes and resulted in the discovery of the basal-like/triple-negative breast cancer (TNBC) subtype. His work has led to the understanding that breast cancer should be viewed as a set of characteristically-distinct subtypes, laying the foundation for using precision medicine in breast cancer.

Dr. Perou's research crosses many scientific disciplines: genomics (the science of mapping the complete set of genes present in a cell or organism), cancer biology, bioinformatics (the science of collecting and analyzing complex biological data), epidemiology, and clinical trials. For nearly two decades, his research has mainly focused on deciphering genomic information to inform therapeutic decision making for breast cancer patients. As a postdoctoral fellow in the laboratory of Dr. David Botstein, then at Stanford University, Dr. Perou was among the first to use DNA microarrays to molecularly profile human cancers. He showed that gene expression profiles in breast cancer could be associated with patient outcomes. He went on to identify biologically-based ("intrinsic") subtypes of breast cancer — Luminal A, Luminal B, HER2-enriched, and Basal-like — that are distinguished by differences in their gene expression patterns.

Since then, his research has focused on understanding the genetic causes of these distinct subtypes and the clinical importance of this new molecular taxonomy. Dr. Perou and colleagues were among the first to associate specific genetic mutations with specific breast cancer subtypes; for example, luminal/ER+ breast cancers frequently express mutated GATA3 and Basal-like tumors often have TP53 mutations and are linked to BRCA1 germline mutations. When The Cancer Genome Atlas (TCGA) project began its study of breast cancers in 2009, they called upon Dr. Perou to Chair the TCGA Breast Cancer Analysis Working Group which identified many other unique genetic features of each breast cancer subtype. Dr. Perou's lab also discovered that the breast cancer subtypes were of prognostic and predictive value, i.e., that the different subtypes have different prognoses and respond differently to chemotherapy. His lab has developed genomic signatures for use as clinical diagnostics, and is credited with the development of a clinical assay for intrinsic subtyping, the PAM50 gene expression assay. In a North Carolina population-based study (the Carolina Breast Cancer Study), he and his colleagues found that specific breast cancer subtypes are more frequent in certain groups (e.g., Basal-like more common in African Americans and younger women), providing a biological explanation for some of the breast cancer outcome disparities observed in the U.S.

More recently, Dr. Perou has been investigating the efficacy of new drugs and new drug combinations to treat each breast cancer subtype. Other studies have focused on how the

immune system contributes to patient outcomes and the potential for using immunotherapies to treat aggressive breast cancers like TNBC and basal-like breast cancer. He is also using big data to further characterize the HER2+ breast cancer subtype and identify additional genetic drivers of this subtype (beyond HER2) that could be targeted with new therapeutic approaches and ultimately improve patient outcomes.

Dr. Perou received his Ph.D. from the University of Utah in 1996. After his postdoctoral fellowship at Stanford University, he joined the faculty of the Lineberger Comprehensive Cancer Center (LCCC), University of North Carolina at Chapel Hill (UNC) as an Assistant Professor of Genetics in 2000. Currently, Dr. Perou is the Faculty Co-Director of the LCCC Bioinformatics Group, the Co-Director of the LCCC Breast Cancer Research Program, a Professor of Genetics and of Pathology & Laboratory Medicine and holds the May Goldman Shaw Distinguished Professor of Molecular Oncology Endowed Chair.

Dr. Perou's pioneering research to decipher complex genetic information and link it to clinical outcomes has changed the way researchers understand, classify and study breast cancer, and this work has reshaped the way breast cancer is diagnosed and treated. His work is paving the way for the use of more personalized treatment options for breast cancer patients, and will have a lasting impact for years to come.