Ongoing research in an MSU physiology lab is advancing a personalized medicine approach for breast cancer treatment and could ultimately lead to a cure.

Last year, Eran Andrechek, associate professor of physiology, along with Ph.D. student Dan Hollern and others, analyzed 1,172 mouse mammary tumor samples from 26 different preclinical models and were able to compile one of the largest mouse databases to show which strains of mice were best suited to study a particular type of human breast cancer.

“We found that the vast majority of human breast cancers can be represented by one of the strains we studied,” Andrechek said.

“There are definitely clear parallels between mice and men in relation to breast cancer and this study provides legitimacy to using these models so ultimately a cure can be found,” he said.

His lab’s current project builds on that previous work.

“We took the data we collected from the previous study and are analyzing it to make predictions,” Andrechek said. “This is the work of Jon Rennhack, one of the newer graduate students in the lab.

“One example is HER2 positive human breast cancer. Around 25-30 percent of human breast cancer is HER2 positive—which means there is an amplification of the HER2 gene,” Andrechek said. “Jon has identified regions of the genome in these tumors that are amplified or deleted—using computational methods. We found that these amplification and deletion patterns very much correlate with what the specific tumor physically looks like.”

The next step is to transfer this data into an online searchable resource.

“We’d also like to take many of the models we’ve been studying and do whole genome sequencing. This would help us determine which type of human breast cancer has specific genes that are mutated; and if we want to study a particular kind of human breast cancer, there is a correlating mouse model that best mimics that type of human breast cancer.”

In related work, Jing-Ru Jhan, a Ph.D. student in Andrechek’s lab, is using the bioinformatics techniques from the original research project to study the efficacy of various drug combinations in mouse models.

“We found that the drugs, individually, didn’t have any effect on the tumors; they kept growing,” Andrechek explained. “But when we put the drugs together, the tumors either stopped growing, or shrunk.

“This is really a personalized approach,” Andrechek said. “We can look at the tumor and say, ‘This is the therapy that ought to work for this tumor.’ And it’s working nicely.”