Sequence analysis of genomic DNA is revolutionizing science’s understanding of cancer. One application of DNA sequencing – molecular profiling – is enhancing the treatment of cancer patients. Yale Cancer Center is at the forefront of both molecular profiling of tumor DNA and its translation into cancer treatment for patients.

“For the first time, we have developed the clinical ability to look at cancers and to determine, in many cases, what genes are driving the malignancy. And we can now do that in real time – it used to take months – so it influences patient care decisions. This is part of our effort toward personalized medicine, to link the right drug to the right patient at the right time,” Thomas J. Lynch, Jr., MD, Director of Yale Cancer Center and Physician-in-Chief of Smilow Cancer Hospital at Yale-New Haven, said.

**MOLECULAR PROFILING GOES REAL TIME**
This effort became more focused earlier this year with the formation of a Precision Medicine Tumor Board. “We are bringing the scientists and the clinicians together in one room,” Dr. Herbst said, “so that we can do our best in real time to figure out what’s driving each tumor, and to choose the right drug or clinical trial.”

Yale researchers can now even extract the genetic information from formalin fixed tumor samples, including small needle biopsy specimens, archived for several decades, determining the exact changes that cause a cancer to progress or recur and precisely targeting these changes for treatment.

Therapies usually target driver mutations in cancer, which are molecules or genes that fuel cancer growth and drive each tumor, and to choose the right drug or clinical trial. “The drugs are very effective because they exactly hit the drivers of the cancer,” Dr. Herbst said. “But they have relatively few side effects.”

The ongoing cataloguing of mutations is the heart of so many trials now, “Dr. Lynch said, “because cancer drugs are increasingly designed to target specific molecular populations. Because we are so good at profiling, we’re able to get patients on to these Phase I trials quicker, and that’s attractive to Pharma. ”

It’s also attractive to the National Institutes of Health, which recently selected Yale from among 150 applicants to be one of three cancer centers that will analyze tumors for mutations and then funnel patients into appropriate Phase I trials. “We’re not just looking at lung cancer, breast cancer, or colon cancer,” added Dr. Herbst. “We’re thinking about the engine driving each tumor, no matter where it’s coming from. If we can figure out what’s best, we should be able to target that tumor more effectively and safely. If we can use the cancer tissues for prognosis and to develop predictive drugs for the right patient, that’s the future.”