

## Personalized Medicine in Cancer Care

The delivery of cancer care is becoming ever more complex, involving multiple disciplines for the diagnosis and the treatment of patients. In response, Yale Pathology Labs and the Yale Cancer Center have developed multidisciplinary clinical programs to care for patients diagnosed with different types of cancer. These clinical programs allow physicians and specialists at Yale Cancer Center to focus their skills on each specific type of cancer, enabling them to provide superior care to our patients through a patient-friendly system of care led by a patient care coordinator. The internationally and nationally recognized faculty within the programs provide unparalleled cancer expertise and are leaders in both the treatment of cancers and the development of innovative treatment strategies.

While some diseases are treated in the absence of a tissue diagnosis, it is accurate to say that no cancer therapy is ever administered without a pathological diagnosis. In most instances, subtleties of the pathological interpretation modulate the combination of therapies best suited for a patient, and these subtleties are discussed in the multidisciplinary, patient-focused working groups known as "tumor boards." The expansion of the Yale Cancer Center and the recent opening of the Smilow Cancer Hospital greatly increase our pathologists' capacity to work in a tightly integrated multidisciplinary mode.

With the recent progress in the understanding of cancer biology, the creation of new technologies, and the development of targeted therapies comes the opportunity for pathology to contribute to personalized, efficient, and precise cancer medicine. It is no longer sufficient to characterize a tumor only by its appearance and the degree of resemblance to the tissue of origin. Patients with many common tumors (e.g., breast, lung, colon) benefit from an in-depth analysis of their tumors at the molecular level, enabling the therapist to select specific drugs and to predict, or follow, the response with enhanced accuracy. Yale Pathology Labs excel in these molecular diagnostic areas.

The Tumor Profiling Laboratory provides high-throughput testing of tumors for mutations that predict likely responsiveness or resistance to targeted therapeutic agents. For this testing, DNA is extracted from formalin-fixed, paraffin-embedded tissues and subjected to highly parallel, real-time PCR to detect specific DNA alterations (single nucleotide substitutions and small deletions and insertions) in a variety of different genes. A profile of the mutations is assembled for each tumor tested, indicating those drugs that may or may not be effective in treating a patient's tumor. Tumors of any type may be analyzed in this manner. The set of genes and intragenic DNA sites examined for mutations is continuously expanded as new predictive mutations are described both for approved drugs and for those in experimental trials.

