Training Tomorrow’s Cancer Biologists

While cancer research has led to significant advances in recent decades, there is still a pressing need to understand more about the fundamentals of cancer biology and to connect this information to new forms of treatment. Cancer research has identified a number of new therapeutic targets that drive the excessive growth of cancer cells. The ability to sequence tumor DNA and the huge amounts of data generated by new sequencing technologies have opened new opportunities for understanding the genetic makeup of each tumor, and the subsequent development of personalized treatments. “The overall challenge is to have analyses and therapies that will target cancer drivers for all cancers. This requires computational tools for deep analysis of tumors through DNA sequencing and other methods, and the teamwork of cancer biologists working closely with cancer clinicians,” said David Stern, PhD, Professor of Pathology and Associate Director for Shared Resources at Yale Cancer Center. In response to this changing landscape, Yale Cancer Center is developing a new cancer-focused training program for PhD and postdoctoral students.

Training clinicians and scientists is one of Yale Cancer Center’s top priorities both in terms of its strategic vision and in its role as an NCI-designated Cancer Center. Yale is already educating cancer biologists through the Biological and Biomedical Sciences (BBS) program, an interdisciplinary doctoral program that spans the entire institution. The new Cancer Biology Training Program will build upon the foundation already offered by BBS. Academically, it will be similar to what is taking place — including a course on the cellular and molecular biology of cancer that has been offered for the past 20 years — but with the addition of expanded cancer-focused coursework and clinical components. “The new training components that we’re proposing will provide cancer PhD trainers with a real understanding of the practical issues seen in the clinic,” said Dr. Stern, who is slated to direct the new program.

Among the most novel aspects of the program are a Cancer Genetics/Clinical Translation Workshop and formal clinical mentorship by Yale Cancer Center clinicians. The workshop is a unique course that will deepen students’ clinical knowledge through coursework in tumor sequencing, cancer pharmacology, and clinical practice topics, as well as attendance at some sessions of the Precision Medicine Tumor Board, which includes discussions between clinicians and biologists on the implications of tumor sequencing results. “It’s a great context for PhD trainees to learn from on-the-ground examples of real-world tumor DNA sequencing,” Dr. Stern explained. “It gets them thinking about some of the practical challenges faced by clinicians in the context of real clinical discussions.”

The expertise provided by clinical oncologists will add depth to the program to better educate scientists, with results that may potentially find their way back to the clinic. For example, patients treated for lung cancer at Smilow Cancer Hospital have their tumors screened for two types of DNA mutations. At the same time, there are already at least 15 FDA-approved drugs. However, only a small subset of lung cancer tumors have these mutations. At the same time, there is a great amount of DNA sequencing data available to researchers that may point to potential therapeutic targets for which drugs have not yet been developed. Collaboration between clinicians and scientists will foster the development of novel therapeutic approaches and investigations present their research findings. It’s a great place where the medical side and the research side are combining,” she said. “It’s great to learn firsthand how treatments are used and not just get it from the lab.”

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Yale Cancer Center is currently applying for NIH funding and seeking private funds to formally establish and expand the program. In the meantime, in recent years, the Cancer Center has contributed funding to support cancer-focused doctoral and postdoctoral graduate students through the Yale Cancer Center predoctoral fellowship training program and through the Leslie H. Warner postdoctoral fellowship program. One awardee, Nathan Fons, is a second-year PhD student. Nathan enthusiastically decided on cancer research after rotating through the lab of Ranjit Bindra, MD, PhD.

“It’s great that Yale has a focus for wanting to be a cancer biologist, instead of just molecular biology,” said Molly Gale, a third-year PhD student who was awarded a fellowship from the National Science Foundation. She noted that scientists in the Pathology Department, where she conducts her research, are in close contact with Yale Cancer Center clinicians and that students benefit by going to Yale Cancer Center Grand Rounds and talks in which oncologists discuss therapeutic approaches and investigators present their research findings. “It’s a cool place where the medical side and the research side are combining,” she said. “It’s great to learn firsthand how treatments are used and not just get it from the lab.”

Molly Gale, David Stern, PhD, Professor of Pathology and Associate Director for Shared Resources at Yale Cancer Center, and Nathan Fons