

Dana-Farber Cancer Institute

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Translational research at Dana-Farber

Forging new ground—and new collaborations—in translating research into cancer therapies.

When Sidney Farber successfully used an experimental drug to treat childhood leukemia in 1947, he made the world realize that sustained research is the key to curing cancer—a founding principle of Dana-Farber Cancer Institute. Nearly 70 years later, that concept still drives Dana-Farber. For example, Dana-Farber devotes half its efforts and resources to research and half to patient care, unlike other cancer centers that focus mostly on patient care. Today, collaborations between academia and industry foster the translation of research into therapies. Dana-Farber Cancer Institute is uniquely positioned for such joint ventures thanks to its balanced portfolio of research and clinical care. In addition, to keep pace with the ever-changing investor and industry landscapes, Dana-Farber has invented new research models, branching out from its purely inquiry-based roots to become a premier oncology research center poised for collaboration in a number of different areas (Fig. 1).

Building new research initiatives

To create a successful translational infrastructure, Dana-Farber has formed a suite of over 15 Integrative Research Centers housing cutting-edge technologies, designed to work with one another and with industry partners. This powerful platform for drug discovery and development combines the efforts of physicians, biologists and chemists to accelerate the discovery, evaluation, refinement and early testing of potential therapies.

What's more—and perhaps key—the roughly 200 researchers at these centers are all experienced Ph.D. investigators and technicians, and many of them have backgrounds in the pharmaceutical and biotechnology industries, which creates a culture of accountability and goal-oriented work. These centers cross-pollinate with one another and with the academic research community at Dana-Farber, creating an environment where early-stage compounds from Dana-Farber and from industry partners can be piloted all the way to carefully designed phase 1 trials with accompanying biomarkers. “Our centers are set up to be translational and geared toward taking new molecules into the clinic, in addition to supporting curiosity-driven research,” said O. Prem Das, Dana-Farber's chief research business development officer.

For example, Dana-Farber's Belfer Institute for Applied Cancer Science focuses on industrial-level target discovery, target validation and compound development using patient-derived cell lines and xenograft models. It has long been an active collaborator with industry. In 2014, the Belfer Institute entered a 3-year collaboration with Johnson & Johnson Innovation Center. The

collaboration leverages the Belfer Institute's lung cancer research platform to evaluate effective combinations of immunotherapy drugs, explore biological mechanisms of drug resistance and pinpoint lung cancer targets for new immunotherapy drugs.

Similarly, the Lurie Family Imaging Center features specially designed MRI, CT, PET, ultrasound and optical scanners within the animal-housing area to help researchers monitor tumors and their characteristics in mice without the need to kill animals. This ‘mouse hospital’ will reduce the animal use-related costs in the development of drugs.

In the Early Drug Development Center, Dana-Farber researchers help industry partners design and conduct phase 1 clinical trials of novel anti-cancer agents that might become effective new treatments. Other centers cover areas such as precision medicine, epigenetics, genomics, cancer vaccines, immuno-oncology and others.

Another groundbreaking undertaking by the institute is the creation of one of the world's largest databases of genetic abnormalities in cancer cells. Called Profile, the program has amassed more than 10,000 tumor genetic profiles since 2011. Around 50% of the patients treated at Dana-Farber have their tumor genomes represented in Profile. Scientists at the institute use next-generation sequencing to analyze DNA samples from participating cancer patients and create personalized tumor profiles that can be cross-referenced against patient records and samples. Currently, Profile scans over 300 cancer-related genes for mutations and other DNA abnormalities to pinpoint the genetic roots of the cancer. Although Dana-Farber doesn't license this information, the data are available to researchers at the institute and to their industry or academic collaborators for testing and investigation of scientifically valid and useful questions.

From lab to licensing

Dana-Farber boasts an impressive track record in bringing novel therapies to the clinic. On the small-molecule front, Dana-Farber's licensing partners brought six new chemical entities to phase 1 development between 2012 and 2015. Two of these have progressed to phase 2 trials. Dana-Farber owns or co-owns an extensive portfolio of patents relevant to PD-1 and PD-L1 inhibitors, currently licensed non-exclusively to most of the key players in this area. These antibodies are perhaps the most promising new weapons in the long war on cancer, even raising hopes of a lasting cure for some patients. In the area of cancer immunology and vaccines, the sustained effort put in by dedicated Dana-Farber investigators is bearing valuable fruit in the form of patient-derived antibodies, novel vaccine technologies and new antibody targets.

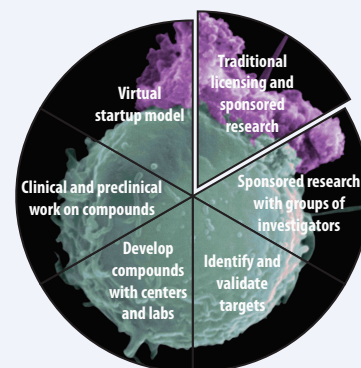


Figure 1: Translational pie chart. Aspects of Dana-Farber's translational research approaches and partnering schemes.

To develop its molecular portfolio, Dana-Farber has branched out to create startup companies. The list of startups includes Acetylon Pharmaceuticals, started in 2010, which Celgene has optioned to buy; Co-Stim, which was acquired by Novartis; and Shape, acquired by Tetralogic. Dana-Farber's successes in this area are noteworthy: 14 of the 15 most recent startups for which Dana-Farber was the leading intellectual-property contributor have succeeded in raising significant funding or exiting through acquisition or initial public offering. Startup activity is high in the current favorable industry environment.

Industry partnerships

Dana-Farber has a long-standing collaboration with Novartis, dating from before the Ciba-Sandoz merger. Partnerships with Janssen and Astellas were announced in 2014. Many others exist but have not been publicly released, and more than 60 industry-sponsored research projects are currently active. They range from focused projects in single laboratories to wide-ranging collaborations involving multiple investigators and centers.

Dana-Farber accommodates the diverse needs of these collaborative projects through a variety of deal structures. “We don't confine ourselves to one model, but rather look at the best way to get the end result. Our flexibility and willingness to focus on the endgame of new therapies is really what guides us,” explained Das. “In the end, it all comes down to our research mission: tomorrow's cures through cutting-edge research.”

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