

Technology Transfer Tactics™



The monthly advisor on best practices in technology transfer

Universities bet big on promising therapeutics

Despite the financial risks, new drug discovery vehicles proliferate on campus

There is nothing like a big hit in the pharmaceutical space to put a university's long-range plans for new research and infrastructure on a solid footing. In fact, large pharmaceutical companies are increasingly leaving the early-stages of drug development to universities and other research institutions. However, while opportunities in the drug discovery space abound, there is no denying the long, difficult road involved with bringing a new therapeutic to market.

It generally takes years or even decades to win FDA approval for a new drug, and the financial requirements of such a journey go well beyond what most federal grants will provide. One further complication: Pharmaceutical companies and other biotechnology investors are expecting a new drug discovery to be further along in its development than in years past before risking their own funds on its future prospects.

Nonetheless, undaunted by the immense challenges involved, a number of universities are sharpening their focus on drug discovery, developing specialized centers or programs -- and even separate companies -- aimed at identifying their most promising discoveries early on so they can then wrap them in a cocoon of expert guidance and support. The bet is that with added resources and a more strategic focus, more drug candidates will ultimately make it into clinical trials, significantly upping the chances for commercialization success.

Generate novel assets

One of the latest technology transfer-driven effort to establish a newly formed drug-discovery vehicle comes from the Wisconsin Alumni Research Association (WARF), the storied TTO for the

University of Wisconsin (UW) in Madison, WI. Aptly named WARF Therapeutics, the new organization is being headed by **Jonathon Young**, who spent more than 20 years in the pharmaceutical industry before joining WARF eight months ago.

Drug discovery is clearly a priority for WARF as the TTO has set aside millions of dollars in internal funding that will funnel through WARF Therapeutics toward selected drug discovery projects over the next five to eight years, explains Young. "There is a big gap where RO1 [National Institutes of Health Research Project Grant] funding ends and where pharmaceutical companies will get interested," he explains. "So the strategy of WARF Therapeutics will be to provide not only resources ... but capabilities and industry experience that was previously not accessible to UW professors in order to advance these programs further and to generate chemical assets that are novel, and that most importantly can be patented."

Young adds that it is these patented chemical assets that will provide the value and inflection point to attract biotechnology companies, pharmaceutical firms and venture capital. However, he acknowledges that the business of drug discovery is very high risk. "For every 100 novel biological targets that are discovered and put into a drug discovery process, 99% of them will fail at some point in time," he says. "Even those that get to a Phase One clinical trials, 90% of those drugs are going to fail."

However, Young notes, some reasons why drugs fail can be anticipated and avoided earlier in the development process if the proper processes are in place. "For example, sometimes the drug is not potent enough, sometimes it is not selective enough which leads to adverse side effects, and sometimes the drug does not reach the region of the body with

the necessary concentrations to be effective,” he says. “One way to think about de-risking is to demonstrate that the drug has been optimized such that it succeeds in those areas that are very common failure points for a lot of other drug [candidates].”

Employ continuous review

An advisory board that includes executives from pharmaceutical and biotechnology companies will review submissions by UW faculty to determine which drug discovery programs will be included in the WARF Therapeutics portfolio. For instance, in the board’s first meeting on May 8, professors each had one hour to present their science. “This was followed by a deep scientific conversation between the advisory board, WARF Therapeutics and the professor,” shares Young. “All of the programs were evaluated based on how well the target was validated, how well the target was de-risked, what was the unmet medical needs that the target might address in the clinic ... and ultimately what would be the commercial potential of that drug.”

Young notes that the early selection and inclusion of a promising discovery in the portfolio does not ensure long-term backing. “I will be continuously reaching out to biotechnology companies, pharmaceutical companies, and venture capitalists to gauge their interest,” he says. “If we find that we are working on a program that has no interest in the external world, that will probably give us the impetus for a no-go decision to stop funding that program going forward.”

On the other hand, if the researchers generate data that a potential licensing or investment partner finds intriguing, the program will likely continue to receive funding and support, notes Young. “The bottom line is WARF Therapeutics will never take a molecule from the very beginning to FDA approval,” he says. “That is a \$2 billion investment and that is not something we are going to do. We are going to need the investment community, whether it [comes from] biotechnology, the pharmaceutical industry, or venture capital to help us along.”

While WARF Therapeutics is essentially a virtual organization, the organization’s drug discovery projects will be developed in some on-campus facilities as well as outside lab resources, notes Young. “We are going to be utilizing contract research organizations as needed in various places around the world.”

Nurture more discoveries

In addition to identifying and then pushing promising drug assets forward, Young intends to take steps to nurture more interest in drug discovery across the UW campus. “For those who are already interested and active in this area, I want to be available to be a consultant to help them identify gaps in their programs and to plan what the next steps area,” he explains.

However Young also hopes to reach what he suspects is a large pool of scientists conducting disease-related research, many of whom may not know how to focus their findings in a therapeutic direction. “That is a group I would like to identify, influence and get engaged in this journey,” he says. “I anticipate rolling out a new initiative to that effect ... to try to foster a drug discovery culture on campus and try to increase the number of people who are thinking about [this endeavor].”

Given the long development period required for commercialization in this space, Young will be focusing on some nearer term markers of success. For instance, he wants to grow the number of professors submitting programs to WARF Therapeutics and to build and maintain a balanced portfolio that can then be graded for value by an independent group. “I think the best indicator of future success is whether we are able to obtain patent protection for innovative and novel targets,” he says. “That is going to be the clearest indication that we are creating licensable material.”

Clearly, WARF is assuming a substantial risk in devoting its considerable financial resources toward this highly focused approach, Young observes. “It is very possible that in five to eight years we will have spent millions and we will have nothing for it,” he says. “That is the inherent risk of drug discovery, and if that is our fate, we will join a long list of biotechnology companies that have tried and not succeeded in this space.”

Engage faculty

One of the first universities to establish a more focused approach toward therapeutics was Purdue University in West Lafayette, IN, which established its Institute for Drug Discovery (IDD) in 2013. Funding for the project came out of a broader \$250 million investment in the life sciences, but the IDD funds provided for new infrastructure and the

resources to move promising discoveries forward.

Karson Putt, the managing director of the IDD, notes there were multiple reasons why the creation of the IDD made sense. “In 2013, if you asked someone how many drugs Purdue had in clinical trials, no one had any idea. Sure, a faculty member might have one or two [drugs in development], but no one ... knew what was going on at the whole of the university,” he says. “One of our first missions was just to figure out what we actually had here that was already ongoing, so we did that and then we tried to pump up our pipeline.”

The approach has clearly borne fruit. Putt recalls that in 2013, the IDD determined the university had eight drugs in clinical trials and a pipeline of perhaps 20 or so molecules that were moving through development. Over the subsequent six years, however, the university has seen 20 of its drugs go into clinical trials including 16 trials that are currently active, he explains. “We are tracking more than 70 drugs in our pipeline, so we are definitely making progress.”

The IDD has succeeded in part by engaging with faculty inventors who are active in the biotechnology arena. “Long-time academics are incredibly brilliant in their area, but a lot of times they don’t have a good understanding of the drug development process,” notes Putt. “The early research they know, but they don’t know what are the next steps they need to take to advance their drug, or what things they need to do to get it [to the point of a] clinical trial.”

The IDD is available as a resource to answer questions and provide guidance, but it will also actively get behind the most promising discoveries, as determined by a drug evaluation committee comprised of clinicians as well as experts from the pharmaceutical industry and academia. “Faculty can come in and pitch their ideas ... and a lot of times get their hearts broken when the committee tells them that they don’t think what they are working on is all that great,” observes Putt. “We definitely search through ideas and are always trying to pick and advance the ones with the most promise.”

Provide an entry point

The vast majority of the drugs that get to the clinical trial stage are being commercialized through start-up companies, observes Putt. “A big entrepreneurial ecosystem has developed here at Purdue, and it is one of the reasons why we have

been so successful,” he says. “In the last five years we have counted 31 start-up companies that have come out of either our affiliated faculty or from students from our affiliated faculty labs, so start-ups are still the main vehicle we use to translate drugs.”

Start-ups may receive seed funding and other types of support from the IDD or the university, but once they have reached this stage, they are largely on their own, notes Putt. “The university is never going to become a pharmaceutical company,” he says. “We are never going to devote the resources and money to move things into Phase Three [clinical trials] and FDA approval because it literally costs ... millions and sometimes billions of dollars to do that, and that is just not the mission of the university or even our institute for that matter.”

However, what the IDD has been able to do is push many more promising discoveries forward to the point where they have a chance at eventually making it into the marketplace. In addition, the IDD has given pharmaceutical companies and others that have interest in biotechnology discoveries a front door for approaching the university with ideas, research needs or new funding. This has proven valuable to both the IDD as well as its partners.

For instance, Putt credits the resources and capabilities of the IDD with Purdue being able to land a large contract with the pharmaceutical company Eli Lilly two years ago. “Typically in the past most pharmaceutical or biotechnology companies would come in and establish a collaboration with a single investigator because they believed that the investigator had something that was interesting to them,” he says.

However, Putt notes, the IDD gives such companies broader opportunities to engage. For instance, rather than focusing on one specific “shiny object,” the IDD can put together a team of experts, many of whom are leaders in a particular field, to address a larger problem that a pharmaceutical or biotechnology company may have. “We have been able to do that successfully,” he says.

It’s always a challenge because the needs of faculty and the needs of pharmaceutical companies are never 100% aligned,” Putt says. “A lot of it is project management and [figuring out] how to keep both parties happy and moving in the same general direction so that faculty [members] are still [satisfying] their intellectual interests ... and the companies are still getting what they consider to

be value for the sometimes large amounts of money they are spending.”

In the case of Eli Lilly, Putt believes that the infrastructure and project management capabilities offered by the IDD made a difference.

Aside from such contracts, however, how is the university assessing the success of the IDD’s approach to drug discovery, particularly given the very long development period involved with commercializing therapeutics? “That is a question we ask ourselves a lot,” acknowledges Putt, noting that, on average, it takes close to twenty years for a drug discovery to become FDA approved -- far longer than the IDD has been in existence.

For now, the university is eyeing shorter-term goals. “We have a lot of drugs moving through our pipeline, and a lot of those have come from a small handful of very prolific faculty. So one of our metrics has involved looking at how we can get more other faculty thinking about drug discovery,” explains Putt. “For example ... in the last five years we have more than tripled the number of faculty that are contributing drugs to our pipeline.”

Putt adds that the university also likes to see more start-up companies around new drug discoveries, and more start-ups attracting investment dollars -- “especially start-ups that we provided seed funding to because that helps validate that someone else thought the companies were a good idea too,” he says. “We make our best educated guesses, we bring in as many experts as we can to look at [discoveries], and we fund what we can.”

Find a strategic partner

With three drugs on the marketplace, the University of Illinois at Chicago (UIC) has demonstrated its strength in drug development research, notes **TJ Augustine**, the interim vice chancellor for innovation there. However, Augustine acknowledges there has been a weakness on the commercialization end. “Where the university lacks as much strength is where you take research into the next phase of commercialization outside the university,” he says.

To plug this gap, UIC is one of several major research universities that has partnered with Deerfield Management, a New York, NY-based healthcare investment management firm. Together they created West Loop Innovations, LLC, a separate company that will focus on accelerating the commercialization of therapeutics developed at

UIC. The same model, creating a separate entity and committing big dollars to advance the university labs’ most promising drug candidates, is being used at numerous sites including Columbia University, Johns Hopkins, Harvard, UNC-Chapel Hill, and UC San Diego.

Deerfield is contributing \$65 million dollars to the UIC endeavor as well as broad expertise in taking therapeutics to market. “With \$10 billion under management, Deerfield has a tremendous ability to financially support commercial endeavors and they have a lot of expertise on the management side for companies, so they really bring that commercialization expertise that we don’t have,” notes Augustine. “I think they have lined up as an ideal partner for us in that capacity.”

Of course, Deerfield will have a strong say in which discoveries receive backing under the West Loop Innovations umbrella. “West Loop has a steering committee which is made up of three people from Deerfield and three people from the university, and that steering committee evaluates proposals from the university’s faculty,” explains Augustine.

The proposals must reach a high bar to win approval, which requires agreement by a majority of both the UIC and the Deerfield members on the steering committee. “It is a really collaborative decision-making process between the university and Deerfield, which I think helps bring together the best of both of our strengths, all the way from scientific discovery to the commercialization and management of start-up entities,” he says.

Projects that get the green light at West Loop will be funded from the discovery stage up to the point where they are ready for clinical trials. “At that stage we would take the technology out of the university and either license it to a third party or create a start-up that would take the technology and go through the next phase of development,” explains Augustine. “This [next phase] would be financed separately, so it would not come out of the \$65 million that Deerfield has pledged [to West Loop]. It would be [additional] investment by Deerfield or other potential investors.”

Establish interim metrics

There are also other resources in the University of Illinois system that will be supporting drug discovery work and assist with West Loop’s efforts. For instance, the Discovery Partners Institute (DPI) is an

interdisciplinary research entity that is geared toward partnering with the private sector. "This partnership with Deerfield fits very closely in that vein," says Augustine. "We look at [it] as an opportunity to help our faculty engage in that kind of commercialization type work that DPI is based upon, and to really help them drive forward the agenda for the health and wellness theme in that institute."

Augustine adds that the DPI is developing a new Drug Discovery and Innovation Pavilion facility on the campus of UIC that will provide space for faculty engaged in translational research efforts.

Augustine acknowledges that it will likely take years to see the impact of the West Loop Innovations endeavor. At this point, the group is funding discovery-stage science at the university, and administrators will be gauging West Loop's

success by regularly assessing how projects are moving along toward clinical trials.

"Once we get to the point where those projects are ready to leave the university, then we will be looking at how much additional investment these technologies are attracting once they are in a start-up or licensed," says Augustine. "The royalty stream for technologies that are licensed will be shared 50/50 by the university and Deerfield, and the moment a new company is formed there will be a 50/50 ownership between the university and Deerfield."

Augustine adds that other investors will likely come in, changing the ownership distribution, but the split will start at 50/50.

Contact Augustine at aaaugustn@uic.edu; Putt at puttk@purdue.edu; and Young at jyoung@warf.org.