Disruptive Technologies Innovation Fund (DTIF)

Mera Project – Hooke Bio Ltd with Munster Technological University (MTU) and University of Galway (UG)

The Disruptive Technologies Innovation Fund (DTIF) is a €500 million challenge-based fund established under Project Ireland 2040. It is one of four funds set up under the National Development Plan (NDP) 2018-2027. It is managed by the Department of Enterprise, Trade and Employment and administered by Enterprise Ireland.

The fund is competitive and is seeking investment in the research, development and deployment of disruptive technologies and applications on a commercial basis. It will drive collaboration between Ireland's world-class research base and industry as well as facilitating enterprises to compete directly for funding in support of the development and adoption of these technologies.

As of 2 April 2025, €376 million has been awarded to 104 projects consisting of 396 project partners from the private sectors and academia.

Location: Clare, Cork and Galway
Responsible: The Department of Enterprise, Trade and Employment
Approved: Call 1 (2018)
DTIF Amount Awarded: €1.9 million
Current Status: Complete
Outputs: High throughput drug screening enhancing the ability to predict the safety and efficacy of new drugs and vaccines while minimising the need for animal testing; Highly skilled employment in regional location; Private sector investment leveraged; Potential to replace animal models in drug screening; Innovation leader

Overview

The success of the pharma sector is built on the ability to manufacture and market new drugs. Pharma companies operate in a very high cost and high-risk environment. The cost of bringing a new drug to market is estimated to be in excess of $2.5 billion. A large part of this cost is due to the high failure rate of early-stage candidate medicines. Furthermore, the cost of drugs coming off patent is estimated to be in the region of $8 billion per annum. Companies are looking to improve their revenue streams by combining existing drugs to improve therapies particularly for personalised drug screening or to tackle new diseases. Drug combinations have been shown to be more successful than monotherapies in a wide range of diseases including cancer, heart disease and HIV.

A large majority of preclinical drugs are tested on animals to determine their efficacy for human consumption. Due to the physiology differences in animals and humans, some marketed drugs can have mild to severe adverse side effects in humans but considered safe following animal testing. Currently, only 1 in 10 drugs make it through clinical trials to market due to poor preclinical models. Animal testing remains the only reliable option to ensure new drugs are safe for human consumption.

Hooke Bio Ltd, in partnership with Munster Technological University and University of Galway sought to develop a fully integrated end-to-end high throughput drug screening platform, the sole key milestone and commercial goal of this project.

Hooke Bio has patented microfluidic technology that generates drug combinations four

times faster and at as little as 10% of the cost of existing technologies. Its platform 'Mera' also utilises 3D cell culture technology which has been shown to give more physiologically relevant results than traditional 2D techniques positioning it suitably for personalised medicine. This platform will, potentially, save up to €120 million in pre-clinical drug development costs and reduce animal testing by 19 million animals per year.

Inputs

The Mera project was awarded €1.9 million in funding under the first Call of the Disruptive Technologies Innovation Fund. Over the course of the project Hooke Bio retained eight employees with aims to expand these numbers to 34 by 2025. During the course of the project, the University of Galway recruited four researchers. Post project these researchers found similar roles in other universities and the pharma sector. Hooke Bio also availed of the Funds prefinance option which granted an almost immediate injection of funds. Towards the end of the project almost all the funding had been drawdown, and the projects objectives achieved.

Hooke Bio has also received investment through their patented technology, attracting €2.2 million of seed funding and winner of numerous awards including the 2017 EI 'Big Ideas One to Watch'.

To date, Hooke Bio have been awarded up to €12 million in investment from a combination of private, angel and public funds. A portion of this has come from the prestigious European Innovation Council (EIC) Accelerator funding of which Hooke were awarded €5.7 million (blended finance) in 2023. The recently launched their service option with hardware launch of their Mera Ultra system scheduled for late 2025. Most recently in Dec 2024, Hooke Bio were successful in the DTIF Call 7 with Relevium Medical and the University of Galway on the RestOAre project worth €4.6 million. Hooke Bio also have 3 patents protecting their technology as well as a freedom to operate and trademark search completed. Currently Hooke Bio retain 16 staff with biological, engineering and finance experience.

Challenges

During the course of the project, the COVID-19 pandemic was one of the largest challenges that the company faced. As a result, the company was required to adapt its work practices to ensure the safety of staff and to conform to government guidelines. There have also been significant delays from suppliers which have had knock on effects in prototyping and design processes. Other impacts include limited ability to attend conferences, meeting and networking though services such as Zoom have helped alleviate this issue.

Staffing and finding people with appropriate technical qualifications is always challenging in the field that Hooke Bio operate in, however, the high quality of graduates and experienced engineers in Ireland has helped the firm get access to top quality engineers and biologists.

The uncertain economic environment has meant that it had postponed starting its next funding round by almost 12 months. This has now commenced. In the meantime, the Enterprise Ireland Sustaining Enterprise Fund has helped the firm bridge some of the funding gap that has arisen.

From a technical perspective the major challenge with translating tissue models is their complexity and their inherent heterogeneity. In the standard drug discovery pipeline, heterogeneity is a serious drawback as it hampers quantitative analysis and affects the robustness of an assay. On the other hand, in precision medicine, this variability, by itself,

may be an important assay parameter that reflects the responsiveness of the patient to drug treatment. The ambition of the proposed project is to introduce more complex and physiologically relevant micro-tissue models that will faithfully represent not only 3D organization but also cell-cell and cell-ECM interactions seen in human disease thereby negating the use of animal models.

Determining a niche area to enter the market has been key for Hooke Bio. In late 2024, they decided to focus on the area of immunotherapy as this application is particularly reliant on data from circulating flow.

Lessons learned

The success of the project relied on good communication with the DTIF team and project partners. A willingness by all parties required the project to adapt to market change has also been critical to timely delivery of milestones. Good communication and flexibility within the project brief are critical to project success.

The technical nature of the project has meant that continuous training for staff in many of the aspects of the work Hooke Bio carry out is key to having the whole team actively involved in the development of the Hooke technology.

As a start-up company many of the challenges Hooke Bio face relate to business development, finance and HR related matters. Finding support to address some of the issues that arise in these areas can be challenging. In future projects either hiring experienced admin/finance personnel early on in the project or identifying services that can meet these needs would be a worthwhile activity.

Outcomes

The overall objective of the proposed project is to create a high throughput (e.g. 3D spheroids/organoids) screening system capable of generating biological data from novel compounds has been met. This technology has the potential to replace animal models in drug screening. Development of this technology will build on Hooke Bio's existing knowhow and capital capabilities. The technologies developed during this project are beyond the state of the art with high potential for further innovation. Hooke Bio have developed validated liver micro-tissues for toxicity screening with the end goal of replacing animal models. It has developed a system capable of feeding, washing and staining micro-tissues simultaneously, and has the ability to run high content screening with live cell imaging and integrated image analysis. Recent applications are focused on immunotherapy testing with CAT-TCR therapies and body-on-a-plate biology with 3D liver, heart and brain models.

The outcome of the proposed project will enable the firm to develop a novel compound toxicology screening platform which should facilitate the goals of the three 'Rs' and enable Europe to compete globally in toxicology screening, with the US. It would enable Hooke Bio to supply the pharmaceutical and compound screening industry with technologies with better performance characteristics than competitors. In addition, the outcomes from the proposed project should:

- Reduce the need for animal testing for pharmaceutical safety screening
- Provide more accurate pre-clinical testing models increasing the success of drug candidates going for clinical testing.
- Provide a platform that can be scaled to include other tissue types; and

- Be usable for screening of environmental and other non-pharmaceutical compounds.

Activities

During the course of the project the consortium engaged in collaborative research which was hindered by the COVID-19 pandemic, resulting in a delayed start date, restrictions (including laboratories access) and recruitment delays. Despite of this, the goal of this project has been achieved. To accomplish this, project activities were divided accordingly between Hooke Bio, MTU (CAPPA) and University of Galway. Hooke Bio developed the micro physiological system used for the maturing, maintaining, drugging, staining, and imaging of 3D microtissues. MTU (CAPPA) were responsible for the design and the development of the optical and mechanical layout of the imaging acquisition system, additionally its software analysis and final testing. University of Galway's objective was to provide Hooke Bio with a benchmarking dataset using industry standard high content drug-discovery/in vitro toxicology technology and to generate the same dataset using Hooke Bio technology as a test of the new technology.

Testimonials

"It isn't an overstatement to say that Hooke Bio owes its current existence to the DTIF funding award", Dr Mark Lyons, CEO, Hooke Bio Ltd

Further information

HookeBio Mera explainer animation - Vimeo

HookeBio immunotherapy animation - Vimeo