Cardiotoxicity Screen Benefits Drug Development Process

Cardiovascular diseases are the leading cause of death in the United States, with 2,200 people dying every day. Researchers are constantly looking for new therapeutics to treat these deadly diseases, and safety testing is critical as new chemical entities move forward on the path to becoming effective drug candidates. But because they are potentially cardiotoxic, many promising drugs are removed from further development and never reach patients.

The Solution

University of Michigan researchers, Todd Herron, Ph.D. and José Jalife, M.D., recognized a need to streamline the drug development process and promote the release of safe new drugs to market. As a result, they designed a platform for cardiotoxicity testing using human-stem-cell-derived cardiac muscle cells. Herron and Jalife have generated an unlimited supply of these cardiac muscle cells that can be cryopreserved, thawed, and cultured. The derived cells display all the physiologic hallmarks of cardiac muscle cells, and can accurately predict eventual cardiotoxicity in humans. These safety tests are required for any potential therapeutic compound, antibody, or other biological/chemical entity prior to FDA approval.

This new platform reduces the chances of advancing experimental drugs with serious cardiac safety issues, and can save the pharmaceutical industry millions of dollars and precious time. It will also catapult the use of human-stem-cell-derived cardiac muscle cells into mainstream toxicity testing, resulting in a significant decrease in the amount of animal testing.

This project was funded by the University of Michigan Translational Research and Commercialization for Life Sciences Program, also known as MTRAC. MTRAC works to “fast forward” projects that have a high potential for commercial success, with the ultimate goal of positively impacting human health.

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**In-vitro cardiototoxicity testing** platform uses human-stem-cell-derived cardiac muscle cells to help quickly move early-stage drugs safely to market, with reduced cost and less animal testing.

**Significant Need**
This new testing platform more accurately predicts eventual cardiotoxicity in humans, limits the need for animal testing, and enables drugs to move to market faster to treat a myriad of diseases.

**Compelling Science**
An unlimited supply of human-stem-cell-derived cardiac muscle cells display all the physiologic hallmarks of cardiomyocytes. The derived cardiomyocytes react as expected to known therapeutic and cytotoxic agents.

**Competitive Advantage**
This in-vitro testing platform is faster, cheaper, and more accurate than the current methods that often involve unreliable animal testing and result in false positive cardiotoxicity results.

**MTRAC Project Key Milestones**

- Complete the development of the dual calcium and membrane voltage measurements in 96 well format
- Complete preservation development
- Explore potential investors and interested commercial entities
- Seek additional sources of private or public funding
- Non-disclosure agreement established with major biotech company
- Human-stem-cell-derived cardiac muscle cells preserved in 96 well plates
- Obtain FDA approvals
- License the technology
- To be determined by licensee.

**Overall Commercialization**

**Commercialization Strategy**
Two possible commercial paths; a license to large pharma to use human cardiac cells in safety studies, and a license to companies providing drug safety screening services.

**Intellectual Property**
Patent application filed. Full patent will be filed after the initial characterization is complete showing the predictability of the system. Another invention disclosure/patent will likely be issued for the high throughput 96 well format optical mapping.

**Engage Investors**
Non-disclosure agreement established with major biotech company.

**Regulatory Pathway**
Approvals from the FDA will be required for commercialization.

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MTRAC funding has been critical as we develop this technology. And the MTRAC business development support is extremely helpful in guiding us towards additional funding opportunities to continue towards commercialization.