VistaGen Therapeutics, Inc.
Form S-1/A
August 06, 2014
As filed with the Securities and Exchange Commission on August 6 , 2014
Registration No. 333-195901

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM S-1/A
(Amendment No. 5)

REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

VISTAGEN THERAPEUTICS, INC.
(Exact name of registrant as specified in its charter)

Nevada	3841	20-5093315
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification Number)

VistaGen Therapeutics, Inc.
343 Allerton Avenue
South San Francisco, CA 94080
(650) 577-3600
(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Shawn K. Singh, J.D.
Chief Executive Officer
VistaGen Therapeutics, Inc.
343 Allerton Avenue
South San Francisco, CA 94080
(650) 577-3600
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Approximate date of commencement of proposed sale to the public: As soon as practicable after this registration statement becomes effective.

Table of Contents

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act, check the following box. [X]

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, please check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. [ ]

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. [ ]

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. [ ]

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definition of “large accelerated filer,” “accelerated filer” and “smaller reporting company” in Rule 12b-2 of the Exchange Act.

Large accelerated filer	[ ]	Accelerated filer	[ ]
Non-accelerated filer (Do not check if a smaller reporting company)	[ ]	Smaller reporting company	[X]

Table of Contents

CALCULATION OF REGISTRATION FEE

Title Of Each Class Of Securities To Be Registered	Proposed Maximum Aggregate Offering Price	Amount Of Registration Fee	
Common stock, $0.001 par value (1)	$	$	(2)
Warrants to purchase shares of common stock			(3)
Shares of common stock issuable upon exercise of warrants(1)			(4)
Total	$15,000,000	$ 4,404.96	(5)

(1) Pursuant to Rule 416 under the Securities Act, the Registration Statement shall also cover any additional shares of common stock that become issuable by reason of any stock dividend, stock split or other similar transaction effected without the receipt of consideration that results in an increase in the number of the outstanding shares of common stock of the Registrant.

(2) Estimated pursuant to Rule 457(o) under the Securities Act of 1933, as amended (the Securities Act).

(3) No fee pursuant to Rule 457(g) under the Securities Act.

(4) Estimated solely for purposes of calculating the registration fee pursuant to Rule 457(g) under the Securities Act.

(5) Previously paid.

The Registrant hereby amends this Registration Statement on such date or dates as may be necessary to delay its effective date until the Registrant shall file a further amendment which specifically states that this Registration Statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, or until the Registration Statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.

Table of Contents

Subject to Completion, dated August 6 , 2014

The information in this preliminary prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell these securities and we are not soliciting an offer to buy these securities in any state where the offer or sale is not permitted.

Preliminary Prospectus

Up to 30,000,000 Shares of Common Stock

and

Warrants to Purchase up to 30,000,000 Shares of Common Stock

We are offering up to 30,000,000 shares of our common stock and warrants to purchase up to 30,000,000 shares of our common stock (the Offering). Each share of common stock we sell in the Offering will be accompanied by a warrant to purchase up to one share of common stock. Each share of common stock and warrant will be sold at a price of $___. The common stock and warrants are immediately separable but can only be purchased together in this Offering. We are not required to sell any specific dollar amount or number of shares of common stock or warrants, but we will use our best efforts to sell all of the shares of common stock and warrants being offered for sale.

Our securities are not listed on a national securities exchange. Our common stock is quoted for trading on the OTC Markets (OTCQB) under the symbol “VSTA”. We do not intend to apply for listing of the warrants on any securities exchange and we do not expect the warrants will be quoted on the OTCQB. On August 5 , 2014, the closing price for our common stock was $0.60 per share.

	Per share (1)	Total
Offering Price	$	$
Placement Agent’s Fee (2)	$	$
Offering Proceeds, Before Expenses	$	$

(1) Per share price represents the offering price for a share of common stock and a warrant to purchase up to one share of common stock.

(2) We have agreed to pay to the placement agent an aggregate cash fee equal to 8. 0 % of the gross proceeds of this Offering, and a fee equal to 1% of the gross proceeds as a non-accountable expense allowance. Notwithstanding the foregoing, the placement agent will not receive any fee or commission on any cash received by the Company upon exercise of any of the warrants issued in connection with this Offering.

Geller Biopharm (Geller Biopharm or Agent), a healthcare investment banking division of Financial West Group, has agreed to act as our placement agent in connection with this Offering. The Agent is not purchasing the securities offered by us, and is not required to sell any specific number or dollar amount of securities. However, Geller Biopharm will use their best efforts to arrange for the sale of the securities offered by us in this Offering. We have agreed to pay the Agent a placement fee equal to 8 .0 % of the gross proceeds of the securities sold by us in this Offering, as well as 1% of the gross proceeds as a non-accountable expense allowance. The Agent, however, will not

be entitled to receive any fee or commission on any cash received by the Company upon exercise of any of the warrants issued in connection with this Offering.

This Offering will terminate on September 30, 2014 unless the Offering is fully subscribed before that date or we decide to terminate the Offering prior to that date. In either event, the Offering may be closed and we may conduct multiple closings without further notice to you. All costs associated with the registration will be borne by us.

Table of Contents

Investing in our securities involves a high degree of risk. Before deciding whether to invest in our securities, you should review carefully the risks and uncertainties described under the heading “Risk Factors” beginning on page 6 of this prospectus, and under similar headings in any amendments or supplements to this prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or passed upon the accuracy or adequacy of this prospectus. Any representation to the contrary is a criminal offense.

The date of this prospectus is August 6 , 2014

Sole Placement Agent

Geller Biopharm

Table of Contents

TABLE OF CONTENTS

ABOUT THIS PROSPECTUS

You should rely only on the information contained in this prospectus. We have not authorized anyone to provide you with additional information or information different from that contained in this prospectus. We are offering to sell, and seeking offers to buy, shares of our common stock and warrants only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or any sale of our common stock and warrants.

We anticipate affecting a reverse split of our authorized, and issued and outstanding shares of common stock prior to consummation of the Offering at a ratio of one-for-twenty (the Stock Consolidation), pending review and acceptance of the Stock Consolidation from the Financial Industry Regulatory Authority (FINRA). Each reference to shares of common stock in this prospectus is pre-Stock Consolidation, and does not reflect the one-for-twenty adjustment that will occur as a result of the Stock Consolidation. See also "Risk Factors" beginning on page 6.

Unless the context otherwise requires, the words "VistaGen Therapeutics, Inc." "VistaGen," "we," "the Company," "us" and " refer to VistaGen Therapeutics, Inc., a Nevada corporation. "VistaGen California" refers to VistaGen Therapeutics, Inc., a California corporation and our wholly owned subsidiary.

Table of Contents

PROSPECTUS SUMMARY

This summary highlights selected information appearing elsewhere in this prospectus and does not contain all the information you should consider before investing in our common stock and warrants. You should carefully read this prospectus in its entirety before investing in our common stock and warrants, including the section entitled "Risk Factors" and our financial statements and related notes included elsewhere in this prospectus.

Overview

We are a stem cell company headquartered in South San Francisco, California, focused on drug discovery, drug rescue and regenerative medicine. We believe better cells lead to better medicines™ and that the key to making better cells is precisely controlling the differentiation of human pluripotent stem cells, which are the building blocks of all cells of the human body. Our stem cell technology platform, which we refer to as Human Clinical Trials in a Test Tube, is based on a combination of proprietary and exclusively licensed technologies for controlling the differentiation of human pluripotent stem cells and producing the multiple types of mature, non-transformed, functional, adult human cells that we use, or plan to use, to reproduce complex human biology and disease and assess, in vitro, the potential therapeutic benefits and safety risks of new drug candidates.

We have used our stem cell-derived human cardiomyocytes (VSTA-CMs™) to design and develop CardioSafe 3D™, our novel, customized in vitro bioassay system for predicting potential cardiotoxicity of new drug candidates, including drug rescue candidates. We believe CardioSafe 3D is more comprehensive and clinically predictive than the hERG assay, currently the only in vitro cardiac safety assay required by FDA guidelines. Our stem cell-derived hepatocytes (VSTA-heps™), highly-functional, non-transformed, mature human hepatocytes, are the foundation of LiverSafe 3D™, our novel, customized bioassay system for predicting potential liver toxicity of new drug candidates, including potential drug metabolism issues and adverse drug-drug interactions. We believe our VSTA-heps have more functionally useful life-span in culture than primary (cadaver) hepatocytes used in FDA-required drug metabolism studies and overcome numerous problems related to commercially-available primary hepatocytes currently used in FDA-required in vitro hepatocyte assays for drug metabolism, such as limited supply, unknown health status of the donor and genetic differences. We believe our Human Clinical Trials in a Test Tube platform, anchored by VSTA-CMs, VSTA-heps, CardioSafe 3D and LiverSafe 3D, offers a new paradigm for evaluating and predicting potential heart and liver toxicity of new drug candidates, including drug rescue candidates, early in development, long before costly, high risk human clinical trials.

We believe using CardioSafe 3D and LiverSafe 3D for our drug rescue programs is the highest-value near term commercial application of the human cells we produce and the novel, customized bioassay systems we have designed and developed. Our drug rescue activities are focused on producing new, safer variants of still-promising new drug candidates previously discovered, optimized and tested for efficacy by pharmaceutical companies and others but terminated before FDA approval due to unexpected heart toxicity or liver toxicity. We refer to these still-promising new drug candidates as Drug Rescue Candidates™. Our drug rescue strategy involves leveraging CardioSafe 3D and LiverSafe 3D to attempt to significantly reduce the toxicity that caused Drug Rescue Candidates to be terminated, and bring new, safer versions of them back into development as promising proprietary new drug candidates. We refer to the new, safer versions of Drug Rescue Candidates we are focused on producing as Drug Rescue Variants™. We anticipate that each lead Drug Rescue Variant we optimize in vitro for safety and efficacy will be suitable as a new drug development program, either internally or under a revenue-generating out-license arrangement with a pharmaceutical or biotechnology company. We have identified and screened using our CardioSafe 3D assays multiple Drug Rescue Candidates. Together with our preexisting CardioSafe 3D validation data, we believe the results of our assessments demonstrate that CardioSafe 3D can correctly distinguish varying levels of cardiotoxicity between new drug candidates, including Drug Rescue Candidates and Drug Rescue Variants. We are now prepared to launch multiple CardioSafe 3D drug rescue programs with proceeds from this Offering.

Table of Contents

Risk Factors

Our business is subject to substantial risk. Please carefully consider the "Risk Factors" beginning on page 6 of this prospectus for a discussion of the factors you should carefully consider before deciding to purchase the securities offered by this prospectus. Additional risks and uncertainties not presently known to us or that we currently deem immaterial may also impair our business operations. You should be able to bear a complete loss of your investment.

Corporate information

VistaGen Therapeutics, Inc. (formerly Excaliber Enterprises, Ltd.), a Nevada corporation, is the parent of VistaGen Therapeutics, Inc., a California corporation founded in 1998. Our principal executive offices are located at 343 Allerton Avenue, South San Francisco, California 94080, and our telephone number is (650) 577-3600. Our website address is www.vistagen.com. The information contained on our website is not part of this prospectus. We have included our website address as a factual reference and do not intend it to be an active link to our website.

Table of Contents

THE OFFERING

Securities offered	Up to 30,000,000 shares of common stock. Warrants to purchase up to 30,000,000 shares of common stock.
Common stock outstanding prior to Offering	25,506,877 shares (as of July 1, 2014).
Common stock outstanding after the Offering	55,506,877 shares (assuming no exercise of any of the warrants offered hereby).
Use of proceeds	We estimate that we will receive up to approximately $ 13.5 million in net proceeds from the sale of common stock in this Offering based on a price of $____ per share of common stock, assuming that the maximum Offering amount is sold, and after deducting the Agent 's commission, non-accountable expense allowance and estimated Offering expenses payable by us. However, this is a best efforts offering, with no minimum, and there is no assurance that we will receive significant proceeds or enough proceeds to execute our business plan. We currently intend to use the net proceeds from the sale of the shares of common stock and warrants in this Offering for research and development, working capital needs, capital expenditures, extinguishment of indebtedness, and other general corporate purposes. See "Use of Proceeds" for additional information regarding the intended use of proceeds from the Offering, including information regarding the potential exchange or conversion of certain indebtedness into equity securities in the event we receive a minimum of $10.0 million in gross proceeds.
Stock consolidation	We intend to affect a reverse split of our authorized and issued and outstanding shares of common stock prior to consummation of the Offering at a ratio of one-for-twenty (the Stock Consolidation), pending review and acceptance of the Stock Consolidation from the Financial Industry Regulatory Authority (FINRA). Each reference to shares of common stock in this prospectus is pre-Stock Consolidation, and does not reflect the one-for-twenty adjustment anticipated as a result of the Stock Consolidation.
Dividend policy	We have never declared or paid and do not anticipate declaring or paying any cash dividends on our common stock in the near future. You should read the "Dividend Policy" section of this prospectus for more information on future declarations and

	payments of dividends.
OTCQB symbol	VSTA. There is no established trading market for the warrants and we do not expect a market to develop.
Risk factors	See “Risk Factors” beginning on page 6 of this prospectus for a discussion of factors you should carefully consider before investing in our securities.

Table of Contents

The number of shares of common stock to be outstanding after this Offering is based on 25,506,877 shares outstanding as of July 1, 2014, and does not include, as of that date:

up to 30,000,000 shares of common stock issuable upon the exercise of the warrants being offered in this Offering;

4,227,357 shares of common stock issuable upon the exercise of outstanding options under our 1999 Stock Incentive Plan and 2008 Stock Incentive Plan, of which approximately 3.73 million were exercisable as of July 1, 2014;

735,200 shares of common stock reserved for issuance in connection with future grants under our 2008 Stock Incentive Plan;

18,981,490 shares of common stock that have been reserved for issuance upon exercise of outstanding warrants, which have exercise prices ranging from $0.50 per share to $2.63 per share;

15,000,000 shares of common stock reserved for issuance upon the exchange of Series A Preferred Stock (Series A Preferred);

7,500,000 shares of common stock reserved for issuance upon the exercise of warrants issuable upon the exchange of Series A Preferred; and

shares of common stock reserved for issuance upon the exchange of newly created Series B Convertible Preferred Stock (Series B Preferred), which Series B Preferred will be issued upon automatic conversion of approximately $4.1 million of outstanding senior secured convertible promissory notes and related accrued interest upon consummation of the Offering, assuming gross proceeds from the Offering of at least $10.0 million. See “Description of Securities – Series B Preferred Stock” for a description of the Series B Preferred.

Platinum Notes

We have issued certain senior secured convertible promissory notes to Platinum Long Term Growth VII, LLC (Platinum) in the aggregate principal amount of $3,522,600 (Platinum Notes). Platinum and the Company have agreed to convert the Platinum Notes, including all accrued interest thereon, totaling approximately $4.1 million at July 1, 2014, into shares of newly created Series B Preferred upon consummation of the Offering, assuming the Offering results in gross cash proceeds to us of at least $10.0 million. See “Description of Securities – Series B Preferred Stock”. Upon conversion of the Platinum Notes, the security agreement executed by the parties securing all obligations under the terms of the Platinum Notes will be terminated, and be of no further force and effect. In addition, upon consummation of the Offering, assuming the Offering results in gross proceeds to us of at least $10.0 million, in addition to certain other changes, the exercise price of certain warrants issued to Platinum will be fixed at the price per share of common stock sold in the Offering.

Table of Contents

SUMMARY FINANCIAL DATA

The following table presents summary financial data for the periods indicated. The summary statements of operations data for the years ended March 31, 2014 and 2013 and the balance sheet data as of March 31, 2014 and 2013 have been derived from our audited financial statements and notes thereto, which are included elsewhere in this prospectus. Our historical results are not necessarily indicative of the results that may be expected in the future, and our interim results are not necessarily indicative of the results to be expected for the full fiscal year. You should read this information together with our financial statements and related notes, "Management's Discussion and Analysis of Financial Condition and Results of Operations," "Use of Proceeds" and "Capitalization" included elsewhere in this prospectus.

(Dollars in thousands, except share and per share data)	Fiscal Year Ended March 31,	
	2014	2013
Revenues:		
Grant revenue	$ -	$ 200
Total revenues	-	200
Operating expenses:		
Research and development	2,481	3,431
General and administrative	2,548	3,562
Total operating expenses	5,029	6,993
Loss from operations	(5,029)	(6,793)
Other expenses, net:		
Interest expense, net	(1,503)	(921)
Change in warrant liabilities	3,567	(1,636)
Loss on early extinguishment of debt	-	(3,568)
Other income	-	35
Loss before income taxes	(2,965)	(12,883)
Income taxes	(3)	(4)
Net loss	(2,968)	(12,887)
Deemed dividend on Series A Preferred Stock	-	(10,193)
Net loss attributable to common stockholders	$ (2,968)	$ (23,080)
Basic net loss attributable to common stockholders per common share	$ (0.14)	$ (1.27)
Diluted net loss attributable to common stockholders per common share	$ (0.19)	$ (1.27)
Weighted average shares used in computing:		
Basic net loss attributable to common stockholders per common share	21,973,149	18,108,444
Diluted net loss attributable to common stockholders per common share	21,973,149	18,108,444

Table of Contents

RISK FACTORS

Investing in our securities involves a high degree of risk. You should consider carefully the risks and uncertainties described below, together with all of the other information in this prospectus, including our financial statements and related notes, before deciding whether to purchase securities in the Offering. If any of the following risks are realized, our business, financial condition and results of operations could be materially and adversely affected.

Risks Related to Our Business and Strategy

We are a development stage biotechnology company with no current revenues or approved products, and limited experience developing new drug, biological and/or regenerative medicine candidates, including conducting clinical trials and other areas required for the successful development and commercialization of therapeutic products, which makes it difficult to assess our future viability.

We are a development stage biotechnology company. We currently have no approved products and generate no revenues, and we have not yet fully demonstrated an ability to overcome many of the fundamental risks and uncertainties frequently encountered by development stage companies in new and rapidly evolving fields of technology, particularly biotechnology. To execute our business plan successfully, we will need to accomplish the following fundamental objectives, either on our own or with strategic collaborators:

produce product candidates;

develop and obtain required regulatory approvals for commercialization of products we produce;

maintain, leverage and expand our intellectual property portfolio;

establish and maintain sales, distribution and marketing capabilities;

gain market acceptance for our products; and

obtain adequate capital resources and manage our spending as costs and expenses increase due to research, production, development, regulatory approval and commercialization of product candidates.

Our future success is highly dependent upon our ability to produce product candidates, including Drug Rescue Variants, using stem cell technology, human cells derived from stem cells, our proprietary human cell-based bioassay systems and medicinal chemistry, and we cannot provide any assurance that we will successfully produce Drug Rescue Variants or other product candidates, or that, if produced, any of our Drug Rescue Variants or other product candidates will be developed and commercialized.

Research programs designed to identify and produce product candidates, including Drug Rescue Variants, require substantial technical, financial and human resources, whether or not any product candidates are ultimately identified and produced. In particular, our drug rescue programs may initially show promise in identifying potential Drug Rescue Variants, yet fail to yield lead Drug Rescue Variants suitable for preclinical, clinical development or commercialization for many reasons, including the following:

our research methodology may not be successful in identifying potential Drug Rescue Candidates;

competitors may develop alternatives that render our Drug Rescue Variants obsolete;

a Drug Rescue Variant may, on further study, be shown to have harmful side effects or other characteristics that indicate it is unlikely to be effective or otherwise does not meet applicable regulatory criteria;

a Drug Rescue Variant may not be capable of being produced in commercial quantities at an acceptable cost, or at all; or

a Drug Rescue Variant may not be accepted as safe and effective by regulatory authorities, patients, the medical community or third-party payors.

Table of Contents

In addition, we do not have a sales or marketing infrastructure, and we, including our executive officers, do not have any significant sales, marketing or distribution experience. We will seek to collaborate with others to develop and commercialize Drug Rescue Variants and future products if and when they are developed. If we enter into arrangements with third parties to perform sales, marketing and distribution services for our products, the resulting revenues or the profitability from these revenues to us are likely to be lower than if we had sold, marketed and distributed our products ourselves. In addition, we may not be successful in entering into arrangements with third parties to sell, market and distribute our Drug Rescue Variants or other product candidates or may be unable to do so on terms that are favorable to us, if any are developed. We likely will have little control over such third parties, and any of these third parties may fail to devote the necessary resources and attention to sell, market and distribute our products effectively. If we do not establish sales, marketing and distribution capabilities successfully, in collaboration with third parties, we will not be successful in commercializing our product candidates.

We have limited operating history with respect to drug development, including our anticipated focus on the identification and assessment of potential Drug Rescue Candidates and no operating history with respect to the production of Drug Rescue Variants, and we may never be able to produce a Drug Rescue Variant.

If we are unable to identify suitable Drug Rescue Candidates for our drug rescue programs, including AV-101, or produce suitable lead Drug Rescue Variants for internal development or out-license to pharmaceutical companies and others, we may not be able to generate sufficient revenues to execute our business plan, which likely would result in significant harm to our financial position and results of operations, which could adversely impact our stock price. There are a number of factors, in addition to the utility of CardioSafe 3D, that may impact our ability to identify and assess Drug Rescue Candidates and produce, develop or out-license and commercialize Drug Rescue Variants, independently or with strategic partners, including:

our ability to identify potential Drug Rescue Candidates in the public domain, obtain sufficient quantities of them, and assess them using our bioassay systems;

if we seek to rescue Drug Rescue Candidates that are not available to us in the public domain, the extent to which third parties may be willing to out-license or sell certain Drug Rescue Candidates to us on commercially reasonable terms;

our medicinal chemistry collaborator’s ability to design and produce proprietary Drug Rescue Variants based on the novel biology and structure-function insight we provide using CardioSafe 3D or LiverSafe 3D; and

financial resources available to us to develop and commercialize lead Drug Rescue Variants internally, or, if we out-license them to strategic partners, the resources such partners choose to dedicate to development and commercialization of any Drug Rescue Variants they license from us.

Even if we do produce a Drug Rescue Variant, we can give no assurance that we will be able to develop and commercialize it as a marketable drug, on our own or in a strategic collaboration. Before we generate any revenues from product sales, we must produce additional product candidates through drug rescue and we or our potential strategic collaborator must complete preclinical and clinical development of one or more of our product candidates, conduct human subject research, submit clinical and manufacturing data to the FDA, qualify a third party contract manufacturer, receive regulatory approval in one or more jurisdictions, satisfy the FDA that our contract manufacturer is capable of manufacturing the product in compliance with cGMP, build a commercial organization, make substantial investments and undertake significant marketing efforts ourselves or in partnership with others. We are not permitted to market or promote any of our product candidates before we receive regulatory approval from the FDA or comparable foreign regulatory authorities, and we may never receive such regulatory approval for any of our product candidates.

Table of Contents

Our CardioSafe 3D internal studies have not been subjected external peer review or validation.

Our internal studies conducted to correlate our CardioSafe 3D results with reported clinical results of reference compounds, and our ability to use CardioSafe 3D to predict the cardiac effects, both toxic and nontoxic, of Drug Rescue Candidates, have not been subjected to external peer review or validation. It is possible, therefore, that the results we have obtained from our internal validation studies may not be replicable by external peer reviewers. We are currently focused on identifying and assessing Drug Rescue Candidates available in the public domain. However, should we seek to license or acquire Drug Rescue Candidates from third-parties, and such third-parties cannot replicate our results or do not have confidence in the capabilities of CardioSafe 3D, it may be difficult for us to in-license or acquire from them certain Drug Rescue Candidates which might be of interest to us in the future. In addition, such third-parties may conclude that their current screening models are better than our CardioSafe 3D assay system and that granting a license to the Drug Rescue Candidate we seek from them is not warranted.

If CardioSafe 3D fails to predict accurately and efficiently the cardiac effects, both toxic and nontoxic, of Drug Rescue Candidates and Drug Rescue Variants, then our drug rescue business will be adversely affected.

Our success is highly dependent on our ability to use CardioSafe 3D to identify and predict, accurately and efficiently, the potential toxic and nontoxic cardiac effects of Drug Rescue Candidates and Drug Rescue Variants. If CardioSafe 3D is not capable of providing physiologically relevant and clinically predictive information regarding human cardiac biology, our drug rescue business will be adversely affected.

We have not yet fully validated LiverSafe 3D for potential drug rescue applications, and we may never do so.

We have developed proprietary protocols for controlling the differentiation of human pluripotent stem cells to produce functional, mature, adult liver cells. However, we have not yet fully validated our ability to use the human liver cells we produce for LiverSafe 3D to predict important biological effects, both toxic and nontoxic, of reference drugs, Drug Rescue Candidates or Drug Rescue Variants on the human liver, including drug-induced liver injury and adverse drug-drug interactions. Furthermore, we may never be able to do so, which could adversely affect our business and the potential applications of LiverSafe 3D for drug discovery, drug rescue and regenerative medicine.

CardioSafe 3D, and, if validated, LiverSafe 3D may not be meaningfully more predictive of the behavior of human cells than existing methods.

The success of our drug rescue business is highly dependent, in the first instance, upon CardioSafe 3D, and, in the second instance, if validated, LiverSafe 3D, being more accurate, efficient and clinically predictive than long-established surrogate safety models, including animal cells and live animals, and immortalized, primary and transformed cells, currently used by pharmaceutical companies and others. We cannot give assurance that CardioSafe 3D, and, when validated, LiverSafe 3D, will be more efficient or accurate at predicting the heart or liver safety of new drug candidates than the testing models currently used. If CardioSafe 3D and LiverSafe 3D fail to provide a meaningful difference compared to existing or new models in predicting the behavior of human heart and liver cells, respectively, their utility for drug rescue will be limited and our drug rescue business will be adversely affected.

We may invest in producing Drug Rescue Variants for which there proves to be no demand.

To generate revenue from our drug rescue activities, we must produce Drug Rescue Variants for which there proves to be demand within the healthcare marketplace, and, if we intend to out-license a particular Drug Rescue Variant for development and commercialization prior to market approval, then also among pharmaceutical companies and other potential strategic collaborators. However, we may produce Drug Rescue Variants for which there proves to be no or limited demand in the healthcare market and/or among pharmaceutical companies and others. If we misinterpret

market conditions, underestimate development costs and/or seek to rescue the wrong Drug Rescue Candidates, we may fail to generate sufficient revenue or other value, on our own or in collaboration with others, to justify our investments, and our drug rescue business may be adversely affected.

Table of Contents

We may experience difficulty in producing human cells and our future stem cell technology research and development efforts may not be successful within the timeline anticipated, if at all.

Our human pluripotent stem cell technology is new and technically complex, and the time and resources necessary to develop new cell types and customized bioassay systems are difficult to predict in advance. We intend to devote significant personnel and financial resources to research and development activities designed to expand, in the case of drug rescue, and explore, in the case of drug discovery and regenerative medicine, potential applications of our Human Clinical Trials in a Test Tube platform. In particular, we are planning to conduct development programs related to producing and using functional, mature adult liver cells to validate LiverSafe 3D as a novel bioassay system for drug rescue, as well as exploratory nonclinical regenerative medicine programs involving blood, bone, cartilage, heart, liver and insulin-producing pancreatic beta-islet cells. Although we and our collaborators have developed proprietary protocols for the production of multiple differentiated cell types, we may encounter difficulties in differentiating particular cell types, even when following these proprietary protocols. These difficulties may result in delays in production of certain cells, assessment of certain Drug Rescue Candidates and Drug Rescue Variants, design and development of certain human cellular assays and performance of certain exploratory nonclinical regenerative medicine studies. In the past, our stem cell research and development projects have been significantly delayed when we encountered unanticipated difficulties in differentiating human pluripotent stem cells into heart, liver and pancreatic cells. Although we have overcome such difficulties in the past, we may have similar delays in the future, and we may not be able to overcome them or obtain any benefits from our future stem cell technology research and development activities. Any delay or failure by us, for example, to produce functional, mature blood, bone, cartilage, liver and insulin-producing pancreatic beta-islet cells could have a substantial and material adverse effect on our potential drug discovery, drug rescue and regenerative medicine business opportunities and results of operations.

If we are unable to keep up with rapid technological changes in our field, we will be unable to operate profitably.

We are engaged in activities in the life sciences field, which is characterized by rapid technological changes, frequent new product introductions, changing needs and preferences, emerging competition, and evolving industry standards. If we fail to anticipate or respond adequately to technological developments, our business, revenue, financial condition and operating results could suffer materially. Although we believe we are the first stem cell technology company focused primarily on drug rescue, there can be no assurance that others are not also working toward or involved in such objectives, and we anticipate that we will face increased competition in the future as competitors develop or access new or improved bioassay systems and explore and enter the drug rescue market with new technologies. Competitors may have significantly greater financial, manufacturing, sales and marketing resources and may be able to respond more quickly and than we can to new opportunities. In light of these advantages, even if our technology is effective in producing Drug Rescue Variants, potential development partners might prefer new drug candidates available from others or develop their own new drug candidates in lieu of licensing or purchasing our Drug Rescue Variants. We may not be able to compete effectively against these organizations. Our failure to compete effectively could materially and adversely affect our business, financial condition and results of operations.

We face substantial competition, which may result in others discovering, developing or commercializing product candidates before, or more successfully, than we do.

Our future success depends on our ability to demonstrate and maintain a competitive advantage with respect to the design, development and commercialization of Drug Rescue Variants. Our competitors may succeed in developing product candidates for the same indications we are pursuing before we do, obtaining regulatory approval for competing products or gaining acceptance of their products within the same markets that we are targeting for our Drug Rescue Variants. If, either on our own or in collaboration with a strategic partner, we are not "first to market" with one of our Drug Rescue Variants, our competitive position could be compromised because it may be more difficult for us or our partner to obtain marketing approval for our Drug Rescue Variant and successfully market it as a second

competitor. We expect any Drug Rescue Variants that we commercialize, either internally or in collaboration with others, will compete with products from other companies in the biotechnology and pharmaceutical industries.

Table of Contents

Many of our competitors have substantially greater research and development and commercial infrastructures and financial, technical and personnel resources than we have. We will not be able to compete successfully unless we:

design, develop, produce and commercialize, either on our own or with collaborators, Drug Rescue Variants that are superior to other products in development or in the market;

attract qualified scientific, medical, sales and marketing and commercial personnel or collaborators;

obtain patent and/or other proprietary protection for our Drug Rescue Variants; and

obtain, either on our own or in collaboration with strategic partners, required regulatory approvals for our Drug Rescue Variants.

Established competitors may invest heavily to quickly discover and develop novel compounds that could make our Drug Rescue Variants obsolete. In addition, any new product that competes with an approved product must demonstrate compelling advantages in efficacy, convenience, tolerability and safety in order to overcome price competition and to be commercially successful. If we are not able to compete effectively against our current and future competitors, our business will not grow and our financial condition and operations will suffer.

Other companies, academic institutions, government agencies and other public and private research organizations are conducting research, seeking patent protection and establishing collaborative arrangements for research, development and marketing of assays similar to ours and Drug Rescue Variants we may produce. These companies and institutions also compete with us in recruiting and retaining qualified scientific and management personnel, obtaining collaborators and licensees, as well as in acquiring technologies complementary to our programs.

As a result of the foregoing, our competitors may develop more effective or more affordable products, or achieve earlier patent protection or product commercialization than we will. Most significantly, competitive products may render any technologies and Drug Rescue Variants that we develop obsolete, which would negatively impact our business and ability to sustain operations.

With respect to drug rescue of Drug Rescue Candidates not otherwise available to us in the public domain, the licensing and acquisition of proprietary small molecule compounds, even compounds that have failed in development due to heart or liver safety concerns, is a highly competitive area, and a number of more established companies may also pursue strategies to license, acquire, rescue and develop small molecule compounds that we may consider to be Drug Rescue Candidates. These established companies have a competitive advantage over us due to their size, cash resources and greater clinical development and commercialization capabilities. In addition, companies that perceive us to be a competitor may be unwilling to sell or license Drug Rescue Candidate rights to us. We have limited experience in negotiating licenses to drug candidates and there can be no assurances that we will be able to acquire or obtain licenses to Drug Rescue Candidates in the future, on commercially reasonable terms, if at all, should we elect to pursue such third-party licenses. If we are unable to acquire or obtain licenses to Drug Rescue Candidates we seek, our business may be adversely affected.

Restrictions on research and development involving human embryonic stem cells and religious and political pressure regarding such stem cell research and development could impair our ability to conduct or sponsor certain potential collaborative research and development programs and adversely affect our prospects, the market price of our common stock and our business model.

Some of our most important ongoing and planned research and development programs involve the use of human cells derived from our controlled differentiation of human embryonic stem cells (hESCs). Some believe the use of hESCs

gives rise to ethical and social issues regarding the appropriate use of these cells. Our research related to differentiation of hESCs may become the subject of adverse commentary or publicity, which could significantly harm the market price of our common stock. Although now substantially less than in years past, certain political and religious groups in the United States and elsewhere voice opposition to hESC technology and practices. We use hESCs derived from excess fertilized eggs that have been created for clinical use in in vitro fertilization (IVF) procedures and have been donated for research purposes with the informed consent of the donors after a successful IVF procedure because they are no longer desired or suitable for IVF. Certain academic research institutions have adopted policies regarding the ethical use of human embryonic tissue. These policies may have the effect of limiting the scope of future collaborative research opportunities with such institutions, thereby potentially impairing our ability to conduct certain research and development in this field that we believe is necessary to expand the drug rescue capabilities of our technology, which would have a material adverse effect on our business.

Table of Contents

The use of embryonic or fetal tissue in research (including the derivation of hESCs) in other countries is regulated by the government, and varies widely from country to country. Government-imposed restrictions with respect to use of hESCs in research and development could have a material adverse effect on us by harming our ability to establish critical collaborations, delaying or preventing progress in our research and development, and causing a decrease in the market interest in our stock. These potential ethical concerns do not apply to induced pluripotent stem cells (iPSCs), or our plans to pursue exploratory nonclinical regenerative medicine studies involving human cells derived from iPSCs, because their derivation does not involve the use of embryonic tissues.

We have assumed that the biological capabilities of induced pluripotent stem cells (iPSCs) and hESCs are likely to be comparable. If it is discovered that this assumption is incorrect, our exploratory research and development activities focused on potential regenerative medicine applications of our Human Clinical Trials in a Test Tube platform could be harmed.

We use both hESCs and iPSCs for drug rescue purposes. However, we anticipate that our future exploratory research and development focused on potential regenerative medicine applications of our Human Clinical Trials in a Test Tube platform primarily will involve iPSCs. With respect to iPSCs, we believe scientists are still somewhat uncertain about the clinical utility, life span, and safety of such cells, and whether such cells differ in any clinically significant ways from hESCs. If we discover that iPSCs will not be useful for whatever reason for potential regenerative medicine applications of our Human Clinical Trials in a Test Tube platform, this would negatively affect our ability to explore expansion of our platform, including, in particular, where it would be preferable to use iPSCs to reproduce rather than approximate the effects of certain specific genetic variations.

If we fail to attract and retain senior management and key scientific personnel, we may be unable to successfully produce, develop trials and commercialize our Drug Rescue Variants.

Our success depends in part on our continued ability to attract, retain and motivate highly qualified management and scientific and technical personnel. We are highly dependent upon our senior management, as well as other employees, consultants and scientific collaborators. As of the date of this prospectus, we have ten full-time employees, which may make us more reliant on our individual employees than companies with a greater number of employees. The loss of services of any of these individuals could delay or prevent the successful development of potential expansions and applications of our Human Clinical Trials in a Test Tube platform and our production and assessment of Drug Rescue Variants or disrupt our administrative functions.

Although we have not historically experienced unique difficulties attracting and retaining qualified employees, we could experience such problems in the future. For example, competition for qualified personnel in the biotechnology and pharmaceuticals field is intense. We will need to hire additional personnel as we expand our research and development activities. We may not be able to attract and retain quality personnel on acceptable terms.

In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in designing our research and development strategy, including our drug rescue strategy. Our consultants and advisors may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us.

We may encounter difficulties in managing our growth and expanding our operations successfully.

As we seek to advance our proposed CardioSafe 3D drug rescue programs, produce and develop Drug Rescue Variants, and develop and validate LiverSafe 3D, we will need to expand our research and development capabilities or contract with third parties to provide these capabilities for us. As our operations expand, we expect that we will need to manage additional relationships with various strategic partners and other third parties. Future growth will impose

significant added responsibilities on members of management. Our future financial performance and our ability to develop and commercialize our product candidates and to compete effectively will depend, in part, on our ability to manage any future growth effectively. To that end, we must be able to manage our research and development efforts effectively and hire, train and integrate additional management, administrative and technical personnel. The hiring, training and integration of new employees may be more difficult, costly and/or time-consuming for us because we have fewer resources than a larger organization. We may not be able to accomplish these tasks, and our failure to accomplish any of them could prevent us from successfully growing the Company.

Table of Contents

If product liability lawsuits are brought against us, we may incur substantial liabilities and may be required to limit commercialization of our product candidates.

If we produce and develop Drug Rescue Variants or regenerative medicine products, either on our own or in collaboration with others, we will face an inherent risk of product liability as a result of the required clinical testing of such product candidates, and will face an even greater risk if we or our collaborators commercialize any such products. For example, we may be sued if any Drug Rescue Variant or regenerative medicine product we develop allegedly causes injury or is found to be otherwise unsuitable during product testing, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability, and a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our product candidates. Even successful defense would require significant financial and management resources. Regardless of the merits or eventual outcome, liability claims may result in:

decreased demand for our Drug Rescue Variants or other products that we may develop;

injury to our reputation;

withdrawal of clinical trial participants;

costs to defend the related litigation;

a diversion of management's time and our resources;

substantial monetary awards to trial participants or patients;

product recalls, withdrawals or labeling, marketing or promotional restrictions;

loss of revenue;

the inability to commercialize our product candidates; and

a decline in our stock price.

Our inability to obtain and retain sufficient product liability insurance at an acceptable cost to protect against potential product liability claims could prevent or inhibit the commercialization of products we develop. Although we maintain liability insurance, any claim that may be brought against us could result in a court judgment or settlement in an amount that is not covered, in whole or in part, by our insurance or that is in excess of the limits of our insurance coverage. Our insurance policies also have various exclusions, and we may be subject to a product liability claim for which we have no coverage. We will have to pay any amounts awarded by a court or negotiated in a settlement that exceed our coverage limitations or that are not covered by our insurance, and we may not have, or be able to obtain, sufficient capital to pay such amounts.

Table of Contents

To the extent we enter into licensing or collaboration agreements to develop and commercialize our product candidates, including Drug Rescue Variants, our dependence on such relationships may adversely affect our business.

We may enter into strategic partnerships in the future, including collaborations with other biotechnology or pharmaceutical companies, to enhance and accelerate the development and commercialization of our product candidates. Our strategy to produce, develop and commercialize our product candidates, including any Drug Rescue Variants, may depend on our ability to enter into such agreements with third-party collaborators. We face significant competition in seeking appropriate strategic partners. Supporting diligence activities conducted by potential collaborators and negotiating the financial and other terms of a collaboration agreement are long and complex processes with uncertain results. Moreover, we may not be successful in our efforts to establish a strategic partnership or other alternative arrangements for any future product candidates and programs because our research and development pipeline may be insufficient, our product candidates and programs may be deemed to be at too early of a stage of development for collaborative effort and/or third parties may not view our product candidates and programs as having the requisite potential to demonstrate safety and efficacy. Even if we are successful in entering into one or more strategic collaboration agreements with third-parties, such collaborations may involve greater uncertainty for us, as we may have less control over certain aspects of our collaborative programs than we do over our proprietary internal development and commercialization programs. We may determine that continuing a collaborative arrangement under the terms provided is not in our best interest, and we may terminate the collaboration. Our collaborators could also delay or terminate their agreements, and our products subject to collaborative arrangements may never be successfully commercialized.

Further, our future collaborators may develop alternative products or pursue alternative technologies either on their own or in collaboration with others, including our competitors, and the priorities or focus of our collaborators may shift such that our programs receive less attention or resources than we would like, or they may be terminated altogether. Any such actions by our collaborators may adversely affect our business prospects and ability to earn revenues. In addition, we could have disputes with our future collaborators, such as the interpretation of terms in our agreements. Any such disagreements could lead to delays in the development or commercialization of potential products or could result in time-consuming and expensive litigation or arbitration, which may not be resolved in our favor.

Even with respect to certain other products that we intend to commercialize ourselves, we may enter into agreements with collaborators to share in the burden of conducting preclinical studies, clinical trials, manufacturing and marketing our product candidates or products. In addition, our ability to apply our proprietary technologies to develop proprietary compounds will depend on our ability to establish and maintain licensing arrangements or other collaborative arrangements with the holders of proprietary rights to such compounds. We may not be able to establish such arrangements on favorable terms or at all, and our future collaborative arrangements may not be successful.

We cannot provide any assurance that our future collaborations will not terminate development before achievement of revenue-generating milestones or market approval, that our future collaborative arrangements will result in successful development and commercialization of Drug Rescue Variants, or that we will derive any revenues from such future arrangements.

Our and our collaborators' relationships with customers and third-party payors in the United States and elsewhere will be subject to applicable anti-kickback, fraud and abuse and other healthcare laws and regulations, which could expose us to criminal sanctions, civil penalties, contractual damages, reputational harm and diminished profits and future earnings.

Healthcare providers, physicians and third-party payors in the United States and elsewhere will play a primary role in the recommendation and prescription of any product candidates for which we may obtain marketing approval. Our or

our future collaborator's arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell and distribute our products for which we or they obtain marketing approval. Restrictions under applicable federal, state and foreign healthcare laws and regulations include the following:

Table of Contents

the federal healthcare anti-kickback statute prohibits, among other things, persons from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service for which payment may be made under federal and state healthcare programs such as Medicare and Medicaid;

the federal False Claims Act imposes criminal and civil penalties, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government and also includes provisions allowing for private, civil whistleblower or "qui tam" actions;

the federal Health Insurance Portability and Accountability Act of 1996 (HIPAA), as amended by the Health Information Technology for Economic and Clinical Health Act (HITECH), imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program. HIPAA and HITECH also regulate the use and disclosure of identifiable health information by health care providers, health plans and health care clearinghouses, and impose obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of identifiable health information as well as requiring notification of regulatory breaches. HIPAA and HITECH violations may prompt civil and criminal enforcement actions as well as enforcement by state attorneys general;

the federal false statements statute prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services;

the federal transparency requirements under the Health Care Reform Law requires manufacturers of drugs, devices, biologics and medical supplies to report to the Department of Health and Human Services information related to physician payments and other transfers of value and physician ownership and investment interests;

analogous state laws and regulations, such as state anti-kickback and false claims laws, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers, and some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring drug manufacturers to report information related to payments to physicians and other health care providers or marketing expenditures; and

analogous anti-kickback, fraud and abuse and healthcare laws and regulations in foreign countries.

Efforts to ensure that our and our future collaborators' business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. It is possible that governmental authorities will conclude that our or their business practices may not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our or their operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, exclusion from government funded healthcare programs, such as Medicare and Medicaid, and the curtailment or restructuring of our operations. If any of the physicians or other providers or entities with whom we or our collaborators expect to do business are found to be not in compliance with applicable laws, they may be subject to criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs.

Table of Contents

If we fail to comply with environmental, health and safety laws and regulations, we could become subject to fines or penalties or incur costs that could have a material adverse effect on the success of our business.

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological materials. Our operations also produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties.

Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of hazardous materials, this insurance may not provide adequate coverage against potential liabilities. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of biological, hazardous or radioactive materials.

In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. These current or future laws and regulations may impair our research, development or production efforts. Failure to comply with these laws and regulations also may result in substantial fines, penalties or other sanctions, which could have a material adverse effect on our operations.

To the extent our research and development activities involve using induced pluripotent stem cells, we will be subject to complex and evolving laws and regulations regarding privacy and informed consent. Many of these laws and regulations are subject to change and uncertain interpretation, and could result in claims, changes to our research and development programs and objectives, increased cost of operations or otherwise harm the Company.

To the extent that we pursue research and development activities involving iPSCs, we will be subject to a variety of laws and regulations in the United States and abroad that involve matters central to such research and development activities, including obligations to seek informed consent from donors for the use of their blood and other tissue to produce, or have produced for us, iPSCs, as well as state and federal laws that protect the privacy of such donors. United States federal and state and foreign laws and regulations are constantly evolving and can be subject to significant change. If we engage in iPSC-related research and development activities in countries other than the United States, we may become subject to foreign laws and regulations relating to human subjects research and other laws and regulations that are often more restrictive than those in the United States. In addition, both the application and interpretation of these laws and regulations are often uncertain, particularly in the rapidly evolving stem cell technology sector in which we operate. These laws and regulations can be costly to comply with and can delay or impede our research and development activities, result in negative publicity, increase our operating costs, require significant management time and attention and subject us to claims or other remedies, including fines or demands that we modify or cease existing business practices.

Legal, social and ethical concerns surrounding the use of iPSCs, biological materials and genetic information could impair our operations.

To the extent that our future stem cell research and development activities involve the use of iPSCs and the manipulation of human tissue and genetic information, the information we derive from such iPSC-related research and development activities could be used in a variety of applications, which may have underlying legal, social and ethical concerns, including the genetic engineering or modification of human cells, testing for genetic predisposition for certain medical conditions and stem cell banking. Governmental authorities could, for safety, social or other purposes,

call for limits on or impose regulations on the use of iPSCs and genetic testing or the manufacture or use of certain biological materials involved in our iPSC-related research and development programs. Such concerns or governmental restrictions could limit our future research and development activities, which could have a material adverse effect on our business, financial condition and results of operations.

Table of Contents

Our human cellular bioassay systems and human cells we derive from human pluripotent stem cells, although not currently subject to regulation by the FDA or other regulatory agencies as biological products or drugs, could become subject to regulation in the future.

Our human cells and human cell-based bioassay systems, including CardioSafe 3D and LiverSafe 3D, are not currently sold, for research or any other purpose, to biotechnology or pharmaceutical companies, government research institutions, academic and nonprofit research institutions, medical research organizations or stem cell banks, and they are not therapeutic procedures. As a result, they are not subject to regulation as biological products or drugs by the FDA or comparable agencies in other countries. However, if, in the future, we seek to include cells we derive from human pluripotent stem cells in therapeutic applications or product candidates, such applications and/or product candidates would be subject to the FDA's pre- and post-market regulations. For example, if we seek to develop and market human cells we produce for use in performing cell therapy or for other regenerative medicine applications, such as tissue engineering or organ replacement, we would first need to obtain FDA pre-market clearance or approval. Obtaining such clearance or approval from the FDA is expensive, time-consuming and uncertain, generally requiring many years to obtain, and requiring detailed and comprehensive scientific and clinical data. Notwithstanding the time and expense, these efforts may not result in FDA approval or clearance. Even if we were to obtain regulatory approval or clearance, it may not be for the uses that we believe are important or commercially attractive.

We intend to rely on third-party contract manufacturers to produce our product candidate supplies and to produce commercial supplies of any approved product candidates we develop on our own. Any failure by a third-party manufacturer to produce for us supplies of product candidates we elect to develop on our own may delay or impair our ability to initiate or complete clinical trials, commercialize our product candidates, or continue to sell any products we commercialize.

We do not currently own or operate any manufacturing facilities, and we lack sufficient internal staff to produce product candidate supplies ourselves. As a result, we have worked with, and plan to continue to work with, third-party contract manufacturers to produce sufficient quantities of our product candidates for future preclinical and clinical testing and commercialization, if needed. If we are unable to arrange for such a third-party manufacturing source, or fail to do so on commercially reasonable terms or on a timely basis, we or our potential strategic partner may not be able to successfully produce, develop, and market our product candidates or may be delayed in doing so.

Reliance on third-party manufacturers entails risks to which we or our potential collaborators would not be subject if we or they manufactured product candidates ourselves or themselves, including reliance on the third party for regulatory compliance and quality assurance, the possibility of breach of the manufacturing agreement by the third party because of factors beyond our control (including a failure to synthesize and manufacture our product candidates in accordance with our product specifications), the possibility of termination or nonrenewal of the agreement by the third party, based on its own business priorities, at a time that is costly or damaging to us, or misappropriation of proprietary formulas or protocols. We will be, and our potential strategic partners may be, dependent, on the ability of these third-party manufacturers to produce adequate supplies of drug product to support development programs and future commercialization of our product candidates. In addition, the FDA and other regulatory authorities require that all product candidates be manufactured according to cGMP and similar foreign standards. Any failure by our or our collaborators' third-party manufacturers to comply with cGMP or failure to scale up manufacturing processes, including any failure to deliver sufficient quantities of product candidates in a timely manner, could lead to a delay in, or failure to obtain, regulatory approval for trial initiation or marketing of any product candidates we may produce, including Drug Rescue Variants. In addition, such failure could be the basis for action by the FDA to withdraw approvals for product candidates previously granted and for other regulatory action, including recall or seizure, fines, imposition of operating restrictions, total or partial suspension of production or injunctions.

Table of Contents

We will, and our potential strategic partners may, rely on contract manufacturers to purchase from third-party suppliers the materials necessary to produce our product candidates for required studies. There may be a small number of suppliers for certain capital equipment and materials that we or our collaborators use to manufacture our product candidates. Such suppliers may not sell these materials to our manufacturers at the times we or they need them or on commercially reasonable terms. We will not have any control over the process or timing of the acquisition of these materials by our manufacturers. Although we and our collaborators generally will not begin a required study unless we or they believe a sufficient supply of a product candidate exists to complete the study, any significant delay in the supply of a product candidate or the material components thereof for an ongoing study due to the need to replace a third-party manufacturer could considerably delay completion of the studies, product testing and potential regulatory approval. If we or our manufacturers are unable to purchase these materials after regulatory approval has been obtained for our product candidates, the commercial launch of our product candidates could be delayed or there could be a shortage in supply, which would impair our ability to generate revenues from the sale of our product candidates.

In addition, we or our potential strategic partner may need to optimize the manufacturing processes for a particular drug substance and/or drug product so that certain product candidates may be produced in sufficient quantities of adequate quality, and at an acceptable cost, to support required development activities and commercialization. Contract manufacturers may not be able to adequately demonstrate that an optimized product candidate is comparable to a previously manufactured product candidate which could cause significant delays and increased costs to our or our collaborators' development programs. Our manufacturers may not be able to manufacture our product candidates at a cost or in quantities or in a timely manner necessary to develop and commercialize them. If we successfully commercialize any of our drugs, we may be required to establish or access large-scale commercial manufacturing capabilities. In addition, assuming that our drug development pipeline increases and matures, we will have a greater need for clinical trial and commercial manufacturing capacity. To meet our projected needs for commercial manufacturing, third party manufactures with whom we work will need to increase their scale of production or we will need to secure alternate suppliers.

Risks Related to Production, Development, and Regulatory Approval of Product Candidates

Even if we are able to begin clinical trails for a Drug Rescue Variant, we may encounter considerable delays and/or expend considerable resources without producing a marketable product capable of generating revenue.

We may never generate revenues from sales of a Drug Rescue Variant or any other product because of a variety of risks inherent in our business, including the following:

- clinical trials may not demonstrate the safety and efficacy of any Drug Rescue Variant, other new drug candidate, biological candidate or regenerative medicine product candidate;

- completion of nonclinical or clinical trials may be delayed, or costs of nonclinical or clinical trials may exceed anticipated amounts;

- we may not be able to obtain regulatory approval of any Drug Rescue Variant, other new drug candidate, biological candidate or regenerative medicine product candidate; or we may experience delays in obtaining any such approval;

- we may not be able to manufacture, or have manufactured for us, Drug Rescue Variants, other new drug candidates, biological candidates or regenerative medicine product candidates economically, timely and on a commercial scale;

- we and any licensees of ours may not be able to successfully market Drug Rescue Variants, other new drug candidates, biological candidates or regenerative medicine product candidates;

physicians may not prescribe our products, or patients or third party payors may not accept our Drug Rescue Variants, other drug candidates, biological candidates or regenerative medicine product candidates;

others may have proprietary rights which prevent us from marketing our Drug Rescue Variants, other new drug candidates, biological candidates or regenerative medicine product candidates; and

competitors may sell similar, superior or lower-cost products.

Table of Contents

In the event we are able to begin a clinical trial of a Drug Rescue Variant, our or our collaborator's future clinical trials may be delayed or halted for many reasons, including:

delays or failure reaching agreement on acceptable terms with prospective contract manufacturing organizations (CMOs), contract research organizations (CROs), and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;

failure of third-party contractors, such as CROs and CMOs, or investigators to comply with regulatory requirements or otherwise meet their contractual obligations in a timely manner;

delays or failure in obtaining the necessary approvals from regulators or institutional review boards (IRBs) in order to commence a clinical trial at a prospective trial site;

inability to manufacture, or obtain from third parties, a supply of drug product sufficient to complete preclinical studies and clinical trials;

the FDA requiring alterations to study designs, preclinical strategy or manufacturing plans;

delays in patient enrollment, and variability in the number and types of patients available for clinical trials, or high drop-out rates of patients;

clinical trial sites deviating from trial protocols or dropping out of a trial and/or the inability to add new clinical trial sites;

difficulty in maintaining contact with patients after treatment, resulting in incomplete data;

poor effectiveness of our product candidates during clinical trials;

safety issues, including serious adverse events associated with our product candidates and patients' exposure to unacceptable health risks;

receipt by a competitor of marketing approval for a product targeting an indication that one of our product candidates targets, such that we are not "first to market" with our product candidate;

governmental or regulatory delays and changes in regulatory requirements, policy and guidelines; or

varying interpretations of data by the FDA and similar foreign regulatory agencies.

We or our collaborator could also encounter delays if a clinical trial is suspended or terminated by us, our collaborator, the IRBs of the institutions in which a trial is being conducted, by the Data Safety Monitoring Board (DSMB) for a trial, or by the FDA or other regulatory authorities. Such authorities may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a drug, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial.

Moreover, if we or our collaborators are able to complete a clinical trial of a product candidate, the results of such trial may not be adequate to support marketing approval. For any such trial, if the FDA disagrees with the choice of

primary endpoint or the results for the primary endpoint are not robust or significant relative to control, are subject to confounding factors, or are not adequately supported by other study endpoints, including overall survival or complete response rate, the FDA may refuse to approve a BLA or NDA. The FDA may require additional clinical trials as a condition for approving our product candidates.

Table of Contents

If we or our collaborator experience delays in the completion of, or termination of, any clinical trial of our product candidates, the commercial prospects of our product candidates will be harmed, and our ability to commence product sales and generate product revenues from any of our product candidates will be delayed. In addition, any delays in completing our clinical trials will increase our costs and slow our product candidate development and approval process. Delays in completing clinical trials could also allow our competitors to obtain marketing approval before we do or shorten the patent protection period during which we may have the exclusive right to commercialize our product candidates. Any of these occurrences may significantly harm our business, financial condition and prospects. In addition, many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates.

Results of earlier clinical trials may not be predictive of the results of later-stage clinical trials.

The results of preclinical studies and early clinical trials of product candidates may not be predictive of the results of later-stage clinical trials. Product candidates in later stages of clinical trials may fail to show the desired safety and efficacy results despite having progressed through preclinical studies and initial clinical trials. Many companies in the biopharmaceutical industry have suffered significant setbacks in advanced clinical trials due to adverse safety profiles or lack of efficacy, notwithstanding promising results in earlier studies. Similarly, our future clinical trial results may not be successful for these or other reasons.

This drug candidate development risk is heightened by any changes in planned clinical trials compared to completed clinical trials. As product candidates are developed through preclinical to early and late stage clinical trials towards approval and commercialization, it is customary that various aspects of the development program, such as manufacturing and methods of administration, are altered along the way in an effort to optimize processes and results. While these types of changes are common and are intended to optimize the product candidates for later stage clinical trials, approval and commercialization, such changes do carry the risk that they will not achieve these intended objectives.

For example, the results of planned clinical trials may be adversely affected if we or our collaborator seek to optimize and scale-up production of a product candidate. In such case, we will need to demonstrate comparability between the newly manufactured drug substance and/or drug product relative to the previously manufactured drug substance and/or drug product. Demonstrating comparability may cause us to incur additional costs or delay initiation or completion of our clinical trials, including the need to initiate a dose escalation study and, if unsuccessful, could require us to complete additional preclinical or clinical studies of our product candidates.

We, as well as any future strategic partner, will need to receive regulatory approval for any new drug candidate, including each Drug Rescue Variant, biological candidate or regenerative medicine product before it may be marketed and distributed, and such regulatory approval may never occur.

Our future success depends heavily on our ability to use stem cell technology, human cells derived from stem cells, proprietary human cell-based bioassay systems, especially CardioSafe 3D, and medicinal chemistry to produce Drug Rescue Variants and, develop, obtain regulatory approval for, and commercialize lead Drug Rescue Variants, on our own or in strategic collaborations. We have not previously submitted a new drug application or NDA, to the FDA, or similar drug approval filings to comparable foreign authorities, for any product candidate. We cannot be certain that any of our product candidates will be successful in clinical trials or receive regulatory approval. Further, our product candidates may not receive regulatory approval even if they are successful in clinical trials. If we do not receive regulatory approvals for our product candidates, we may not be able to continue our operations. Even if we successfully obtain regulatory approvals to market one or more of our product candidates, our revenues will be dependent, in part, upon the size of the markets in the territories for which we gain regulatory approval and have commercial rights. If the markets for patient subsets that we are targeting are not as significant as we estimate, we

may not generate significant revenues from sales of such products, if approved.

Regulatory approval will require, among numerous other things, completing carefully controlled and well-designed clinical trials demonstrating the safety and efficacy of each new product candidate. This process is lengthy, expensive and uncertain. If we encounter delays in the regulatory approval process beyond our control, we may not be able to develop product candidates, raise capital, expand our business or continue our operations

Table of Contents

If we, or our potential strategic partners, experience delays in the enrollment of patients in clinical trials involving our product candidates, our receipt of necessary regulatory approvals could be delayed or prevented.

We or our potential strategic partners may not be able to initiate or continue clinical trials for our product candidates if we or they are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA or other regulatory authorities. Patient enrollment, a significant factor in the timing of clinical trials, is affected by many factors including the size and nature of the patient population, the proximity of patients to clinical sites, the eligibility criteria for the trial, the design of the clinical trial, competing clinical trials and clinicians' and patients' perceptions as to the potential advantages of the drug being studied in relation to other available therapies, including any new drugs that may be approved for the indications we or our collaborators may be investigating. If we or they fail to enroll and maintain the number of patients for which the clinical trial was designed, the statistical power of that clinical trial may be reduced, which would make it harder to demonstrate that the product candidate being tested is safe and effective. Additionally, enrollment delays in clinical trials may result in increased development costs for our product candidates, which would cause the value of our common stock to decline and limit our ability to obtain additional financing. Our inability to enroll a sufficient number of patients for any of our current or future clinical trials would result in significant delays or may require us to abandon one or more clinical trials, and, therefore, product candidates, altogether.

Even if we receive regulatory approval for any of our Drug Rescue Variants or other product candidates, we and/or our potential strategic partners will be subject to ongoing FDA obligations and continued regulatory review, which may result in significant additional expense. Additionally, our product candidates, if approved, could be subject to labeling and other restrictions and market withdrawal and we may be subject to penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our products.

Any regulatory approvals that we or our potential strategic partners receive for our Drug Rescue Variants or other product candidates may also be subject to limitations on the approved indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials, and surveillance to monitor the safety and efficacy of the product candidate, all of which could adversely affect the product’s commercial potential and our revenues. In addition, if the FDA approves any of our product candidates, the manufacturing processes, testing, packaging, labeling, storage, distribution, field alert or biological product deviation reporting, adverse event reporting, advertising, promotion and recordkeeping for the product will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, as well as continued compliance with cGMP for commercial manufacturing and good clinical practices, or GCP, for any clinical trials that we conduct post-approval. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with our third-party manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may result in, among other things:

restrictions on the marketing or manufacturing of the product, withdrawal of the product from the market, or voluntary or mandatory product recalls;

warning letters or holds on clinical trials;

refusal by the FDA to approve pending applications or supplements to approved applications filed by us or our strategic partners, or suspension or revocation of product license approvals;

product seizure or detention, or refusal to permit the import or export of products; and

injunctions, fines or the imposition of other civil or criminal penalties.

-19-

Table of Contents

Risks Related to Our Financial Position and Capital Requirements

We have incurred significant net losses since inception and anticipate that we will continue to incur substantial operating losses for the foreseeable future. We may never achieve or sustain profitability, which would depress the market price of our common stock, and could cause you to lose all or a part of your investment.

We have incurred significant net losses in each fiscal year since our inception in 1998, including net losses of $3.0 million and $12.9 million during the fiscal years ending March 31, 2014 and 2013, respectively. As of March 31, 2014, we had an accumulated deficit of $70.6 million. We do not know whether or when we will become profitable. To date, although we have generated approximately $16.4 million in revenues, we have not commercialized any products or generated any revenues from product sales. Our losses have resulted principally from costs incurred in our research and development programs and from general and administrative expenses. We anticipate that our operating losses will substantially increase over the next several years as we execute our plan to expand our drug rescue, stem cell technology research and development, drug development and potential commercialization activities. Additionally, we expect that our general and administrative expenses will increase in the event we achieve our goal of obtaining a listing on a national securities exchange. The net losses we incur may fluctuate from quarter to quarter.

If we do not successfully develop, out-license, sell or obtain regulatory approval for our future product candidates and effectively manufacture, market and sell, or collaborate to accomplish such activities, any product candidates that are approved, we may never generate revenues from product sales, and even if we do generate product sales revenues, we may never achieve or sustain profitability on a quarterly or annual basis. Our failure to become and remain profitable would depress the market price of our common stock and could impair our ability to raise capital, expand our business, diversify our product offerings or continue our operations. A decline in the market price of our common stock also could cause you to lose all or a part of your investment.

As of July 1, 2014, we had outstanding indebtedness in the aggregate principal amount of approximately $11.3 million, including approximately $9.0 million that may be converted into, exchanged for, or is payable with, our equity securities. Unless we are able to convert such indebtedness into our equity securities, according to existing agreements or otherwise restructure such indebtedness, we may be unable to pay up to approximately $4.2 million of such indebtedness when due in the next twelve months following consummation of this Offering.

At July 1, 2014, we had outstanding indebtedness in the aggregate principal amount of approximately $11.3 million, including approximately $9.0 million of promissory notes that may be converted into or exchanged for our equity securities following the consummation of this Offering, or extinguished upon the exercise of warrants to purchase shares of our common stock associated with certain of such indebtedness. Up to approximately $4.2 million of our outstanding indebtedness is due or will become due from time to time during the next 12 months, to the extent it is not otherwise (i) restructured or (ii) converted into our equity securities following the consummation of this Offering, or otherwise in accordance with certain agreements evidencing, or related to, such indebtedness. No assurances can be given that such conversions, exchanges or extinguishment of indebtedness will occur within the next twelve months following consummation of this Offering, or at all. In the event our indebtedness is not restructured or exchanged or converted into our equity securities, we cannot assure you that we will generate sufficient revenue to repay this indebtedness in full when due. Unless we are able to restructure the terms of such indebtedness, we may be required to raise additional capital through debt and/or equity financing to continue our operations. No assurances can be given that any such financing will be available to us on favorable terms, if at all. Our inability to obtain debt or equity financing in a timely manner and in amounts sufficient to fund our operations, if necessary, would have an immediate and substantial adverse impact on our business, financial condition or results of operations.

Table of Contents

Our independent auditors have expressed substantial doubt about our ability to continue as a going concern.

Our consolidated financial statements for the year ended March 31, 2014 included in this prospectus have been prepared assuming we will continue to operate as a going concern. However, due to our ongoing operating losses and our accumulated deficit, there is doubt about our ability to continue as a going concern. Because we continue to experience net operating losses, our ability to continue as a going concern is subject to our ability to generate a profit and/or obtain necessary funding from outside sources, including obtaining additional funding from the sale of our securities or obtaining loans and grants from financial institutions and/or government agencies where possible. Our continued net operating losses increase the difficulty in completing such sales or securing alternative sources of funding, and there can be no assurances that we will be able to obtain such funding on favorable terms or at all. If we are unable to obtain sufficient financing from the sale of our securities or from alternative sources, we may be required to reduce, defer, or discontinue certain of our research and development activities or we may not be able to continue as a going concern.

We will require substantial additional financing to achieve our goals, and a failure to obtain this necessary capital when needed could force us to delay, limit, reduce or terminate our product development or commercialization efforts.

Since our inception, most of our resources have been dedicated to research and development of the drug rescue capabilities of our human pluripotent stem cell technology. In particular, we have expended substantial resources developing CardioSafe 3D and LiverSafe 3D, and we will continue to expend substantial resources for the foreseeable future developing LiverSafe 3D and CardioSafe 3D Drug Rescue Variants. These expenditures will include costs associated with general and administrative costs, facilities costs, research and development, acquiring new technologies, manufacturing product candidates, conducting preclinical experiments and clinical trials and obtaining regulatory approvals, as well as commercializing any products approved for sale. Furthermore, we expect to incur additional costs associated with operating as a public company.

We have no current source of revenue to sustain our present activities, and we do not expect to generate revenue until, and unless, we out-license a Drug Rescue Variant and/or AV-101 to a third party, obtain approval from the FDA or other regulatory authorities and successfully commercialize, on our own or through a future collaboration, one or more of our compounds. As the outcome of our proposed drug rescue and AV-101 development activities and future anticipated clinical trials is highly uncertain, we cannot reasonably estimate the actual amounts necessary to successfully complete the development and commercialization of our product candidates, on our own or in collaboration with others. In addition, other unanticipated costs may arise. As a result of these and other factors, we will need to seek additional capital in the near term to meet our future operating requirements, and may seek additional capital in the event there exists favorable market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans.

Our future capital requirements depend on many factors, including:

the number and characteristics of the product candidates we pursue, including Drug Rescue Candidates;

the scope, progress, results and costs of researching and developing our product candidates, and conducting preclinical and clinical studies;

the timing of, and the costs involved in, obtaining regulatory approvals for our product candidates;

the cost of commercialization activities if any of our product candidates are approved for sale, including marketing, sales and distribution costs;

the cost of manufacturing our product candidates and any products we successfully commercialize;

our ability to establish and maintain strategic partnerships, licensing or other arrangements and the financial terms of such agreements;

Table of Contents

market acceptance of our products;

the effect of competing technological and market developments;

our ability to obtain government funding for our programs;

the costs involved in preparing, filing, prosecuting, maintaining, defending and enforcing patent claims necessary to preserve our freedom to operate in the stem cell industry, including litigation costs associated with any claims that we infringe third-party patents or violate other intellectual property rights and the outcome of such litigation;

the timing, receipt and amount of potential future licensee fees, milestone payments, and sales of, or royalties on, our future products, if any; and

the extent to which we acquire or invest in businesses, products and technologies, although we currently have no commitments or agreements relating to any of these types of transactions.

Additional funds may not be available when we need them, on terms that are acceptable to us, or at all. If adequate funds are not available to us on a timely basis, we may be required to delay, limit, reduce or terminate drug rescue programs, preclinical studies, clinical trials or other research and development activities for one or more of our product candidates, or cease or reduce our operating activities and/or sell or license to third parties some or all of our intellectual property, any of which could harm our operating results.

Raising additional capital will cause substantial dilution to our existing stockholders and may restrict our operations or require us to relinquish rights to our technologies or product candidates.

To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interests of existing stockholders will be diluted, and the terms of the new capital may include liquidation or other preferences that adversely affect existing stockholder rights. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take certain actions, such as incurring debt, making capital expenditures or declaring dividends. If we raise additional funds through strategic partnerships and alliances and licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies or product candidates, or grant licenses on terms that are not favorable to us. If we are unable to raise additional funds through equity or debt financing when needed, we may be required to delay, limit, reduce or terminate our product development or commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Some of our programs have been partially supported by government grants, which may not be available to us in the future.

Since inception, we have received substantial funds under grant award programs funded by state and federal governmental agencies, such as the NIH, the NIH's National Institute of Neurological Disease and Stroke and the California Institute for Regenerative Medicine. To fund a portion of our future research and development programs, we may apply for additional grant funding from such or similar governmental organizations. However, funding by these governmental organizations may be significantly reduced or eliminated in the future for a number of reasons. For example, some programs are subject to a yearly appropriations process in Congress. In addition, we may not receive funds under future grants because of budgeting constraints of the agency administering the program. Therefore, we cannot assure you that we will receive any future grant funding from any government organization or otherwise. A restriction on the government funding available to us could reduce the resources that we would be able

to devote to future research and development efforts. Such a reduction could delay the introduction of new products and hurt our competitive position.

Table of Contents

Our ability to use net operating losses to offset future taxable income is subject to certain limitations.

If we do not generate sufficient taxable income we may not be able to use a material portion, or any portion, of our existing net operating losses (NOLs). Furthermore, our existing NOLs may be subject to limitations under Section 382 of the Internal Revenue Code of 1986, as amended, which in general provides that a corporation that undergoes an "ownership change" is limited in its ability to utilize its pre- change NOLs to offset future taxable income. Our existing NOLs are subject to limitations arising from previous ownership changes, and if we undergo an ownership change, in connection with a future equity-based financing, series of equity-based financings or otherwise, our ability to utilize NOLs could be further limited by Section 382 of the Internal Revenue Code. Future changes in our stock ownership, some of which are outside of our control, could result in an ownership change under Section 382 of the Internal Revenue Code.

Risks Related to Intellectual Property

We utilize certain technologies that are licensed to us, including key aspects of our Human Clinical Trials in a Test Tube platform. If the licensors terminate the licenses or fail to maintain or enforce the underlying patents, our competitive position and market share will be harmed, and our business could be adversely affected.

We currently use certain licensed technologies to produce cells that are material to our research and development programs, including our drug rescue programs, and we may enter into additional license agreements in the future. Our rights to use such licensed technologies are subject to the negotiation of, continuation of and compliance with the terms of the applicable licenses, including payment of any royalties and diligence, insurance, indemnification and other obligations. If a licensor believes that we have failed to meet our obligations under a license agreement for non-payment of license fees, non-reimbursement of patent expenses, or otherwise, the licensor could seek to limit or terminate our license rights, which could lead to costly and time-consuming litigation and, potentially, a loss of the licensed rights. During the period of any such litigation, our ability to carry out the development and commercialization of potential products could be significantly and negatively affected.

Our license rights are further subject to the validity of the owner's intellectual property rights. As such, we are dependent on our licensors to defend the viability of these patents and patent applications. We cannot be certain that drafting and/or prosecution of the licensed patents and patent applications by the licensors have been or will be conducted in compliance with applicable laws and regulations or will result in valid and enforceable patents and other intellectual property rights. Legal action could be initiated by or against the owners of the intellectual property that we license. Even if we are not a party to these legal actions, an adverse outcome could harm our business because it might prevent these other companies or institutions from continuing to license intellectual property that we may need to operate our business. In some cases, we do not control the prosecution, maintenance or filing of the patents to which we hold licenses, or the enforcement of these patents against third parties.

Certain of our license agreements are subject to termination by the licensor in specific circumstances, including non-payment of license fees, royalties and patent-related expenses. Any such termination of these licenses could prevent us from producing cells for our research and development programs and future commercial activities, including selling or marketing products. Because of the complexity of our human pluripotent stem cell technology and the patents we have licensed, determining the scope of the license and related royalty obligation can be difficult and can lead to disputes between us and the licensor. An unfavorable resolution of such a dispute could lead to an increase in the royalties payable pursuant to the license. If a licensor believed we were not paying the royalties or other amounts due under the license or were otherwise not in compliance with the terms of the license, the licensor might attempt to revoke the license. If our license rights were restricted or ultimately lost, our ability to continue our business based on the affected technology would be severely adversely affected.

We may engage in discussions regarding possible commercial, licensing and cross-licensing agreements with third parties from time to time. There can be no assurance that these discussions will lead to the execution of commercial license or cross-license agreements or that such agreements will be on terms that are favorable to us. If these discussions are successful, we could be obligated to pay license fees and royalties to such third parties. If these discussions do not lead to the execution of mutually acceptable agreements, we may be limited or prevented from producing and selling our existing products and developing new products. One or more of the parties involved in such discussions could resort to litigation to protect or enforce its patents and proprietary rights or to determine the scope, coverage and validity of the proprietary rights of others. In addition, if we enter into cross-licensing agreements, there is no assurance that we will be able to effectively compete against others who are licensed under our patents.

Table of Contents

If we seek to leverage prior discovery and development of Drug Rescue Candidates under in-license arrangements with academic laboratories, biotechnology companies, the NIH, pharmaceutical companies or other third parties, it is uncertain what ownership rights, if any, we will obtain over intellectual property we derive from such licenses to Drug Rescue Variants we may generate or develop in connection with any such third-party licenses.

If, instead of identifying Drug Rescue Candidates based on information available to us in the public domain, we seek to in-license Drug Rescue Candidates from biotechnology, medicinal chemistry and pharmaceutical companies, academic, governmental and nonprofit research institutions, including the NIH, or other third-parties, there can be no assurances that we will obtain material ownership or economic participation rights over intellectual property we may derive from such licenses or similar rights to the Drug Rescue Variants we may generate and develop. If we are unable to obtain ownership or substantial economic participation rights over intellectual property related to Drug Rescue Variants we generate, our business may be adversely affected.

Our ability to protect our intellectual property and proprietary technology through patents and other means is uncertain, and we could be unsuccessful in obtaining adequate patent protection for one or more of our product candidates.

Our commercial success will depend in part on our ability to protect our intellectual property and proprietary technologies. We rely on patents, where appropriate and available, as well as a combination of copyright, trade secret and trademark laws, license agreements and nondisclosure, confidentiality and other contractual restrictions to protect our proprietary technology. However, these legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep any competitive advantage. Pending patent applications of ours or our licensors may not issue as patents or may not issue in a form that will be sufficient to protect our proprietary technology and gain or maintain our competitive advantage. Any patents we have obtained or may obtain in the future, or the rights we have licensed, may be subject to re-examination, reissue, opposition or other administrative proceeding, or may be challenged in litigation, and such challenges could result in a determination that the patent is invalid or unenforceable. In addition, competitors may be able to design alternative methods or products that avoid infringement of these patents or technologies. To the extent our intellectual property, including licensed intellectual property, offers inadequate protection, or is found to be invalid or unenforceable, we are exposed to a greater risk of direct competition. If our intellectual property does not provide adequate protection against our competitors' products, our competitive position could be adversely affected, as could our business. Both the patent application process and the process of managing patent disputes can be time consuming and expensive.

The patent positions of companies in the life sciences industry can be highly uncertain and involve complex legal and factual questions for which important legal principles remain unresolved. A number of life sciences, biopharmaceutical and other companies, universities and research institutions have filed patent applications or have been issued patents relating to stem cells, use of stem cells and other modified cells to treat disease, disorder or injury, and other technologies potentially relevant to or required by our existing and planned products. We cannot be certain that patents we have filed or may file in the future will be issued or granted, or that issued or granted patents will not later be found to be invalid and/or unenforceable. The standards applied by the United States Patent and Trademark Office (US PTO) and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology and pharmaceutical patents. Consequently, patents may not issue from our pending or future patent applications. As such, we do not know the degree of future protection that we will have on certain of our proprietary products and technology.

Our patents and patent applications may not be sufficient to protect our products, product candidates and technologies from commercial competition. Our inability to obtain adequate patent protection for our product candidates or platform technology could adversely affect our business.

Publication of discoveries in scientific or patent literature tends to lag behind actual discoveries by at least several months and sometimes several years. Therefore, the persons or entities that we or our licensors name as inventors in our patents and patent applications may not have been the first to invent the inventions disclosed in the patent applications or patents, or the first to file patent applications for these inventions. As a result, we may not be able to obtain patents for discoveries that we otherwise would consider patentable and that we consider to be extremely significant to our future success.

Table of Contents

Where several parties seek U.S. patent protection for the same technology, the US PTO may declare an interference proceeding in order to ascertain the party to which the patent should be issued. Patent interferences are typically complex, highly contested legal proceedings, subject to appeal. They are usually expensive and prolonged, and can cause significant delay in the issuance of patents. Moreover, parties that receive an adverse decision in interference can lose patent rights. Our pending patent applications, or our issued patents, may be drawn into interference proceedings, which may delay or prevent the issuance of patents or result in the loss of issued patent rights. If more groups become engaged in scientific research related to hESCs, the number of patent filings by such groups and therefore the risk of our patents or applications being drawn into interference proceedings may increase. The interference process can also be used to challenge a patent that has been issued to another party.

Outside of the U.S., certain jurisdictions, such as Europe, Japan, New Zealand and Australia, permit oppositions to be filed against the granting of patents. Because we may seek to develop and commercialize our product candidates internationally, securing both proprietary protection and freedom to operate outside of the U.S. is important to our business. In addition, the European Patent Convention prohibits the granting of European patents for inventions that concern “uses of human embryos for industrial or commercial purposes”. The European Patent Office is presently interpreting this prohibition broadly, and is applying it to reject patent claims that pertain to hESCs. However, this broad interpretation is being challenged through the European Patent Office appeals system. As a result, we do not yet know whether or to what extent we will be able to obtain European patent protection for our proprietary hESC-based technology and systems.

Patent opposition proceedings are not currently available in the U.S. patent system, but legislation is pending to introduce them. However, issued U.S. patents can be re-examined by the US PTO at the request of a third party. Patents owned or licensed by us may therefore be subject to re-examination. As in any legal proceeding, the outcome of patent re-examinations is uncertain, and a decision adverse to our interests could result in the loss of valuable patent rights.

Successful challenges to our patents through interference, opposition or re-examination proceedings could result in a loss of patent rights in the relevant jurisdiction(s). As more groups become engaged in scientific research and product development areas of hESCs, the risk of our patents being challenged through patent interferences, oppositions, re-examinations or other means will likely increase. If we institute such proceedings against the patents of other parties and we are unsuccessful, we may be subject to litigation, or otherwise prevented from commercializing potential products in the relevant jurisdiction, or may be required to obtain licenses to those patents or develop or obtain alternative technologies, any of which could harm our business.

Furthermore, if such challenges to our patent rights are not resolved promptly in our favor, our existing business relationships may be jeopardized and we could be delayed or prevented from entering into new collaborations or from commercializing certain products, which could materially harm our business.

Issued patents covering one or more of our product candidates or technologies could be found invalid or unenforceable if challenged in court.

If we were to initiate legal proceedings against a third party to enforce a patent covering one of our product candidates or technologies, the defendant could counterclaim that our patent is invalid and/or unenforceable. In patent litigation in the United States, defendant counterclaims alleging invalidity and/or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, for example, lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the US PTO, or made a misleading statement, during prosecution. The outcome following legal assertions of invalidity and unenforceability during patent litigation is unpredictable. With respect to the patent validity, we cannot be certain, for example, that

there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, we would lose at least part, and perhaps all, of the patent protection on one or more of our products or certain aspects of our platform technology, Human Clinical Trials in a Test Tube. Such a loss of patent protection could have a material adverse impact on our business.

Table of Contents

Claims that any of our product candidates, including our Human Clinical Trials in a Test Tube, or, if commercialized, the sale or use of our products infringe the patent rights of third parties could result in costly litigation or could require substantial time and money to resolve, even if litigation is avoided.

We cannot guarantee that our product candidates, the use of our product candidates, or our platform technology, do not or will not infringe third party patents. Third parties might allege that we are infringing their patent rights or that we have misappropriated their trade secrets. Such third parties might resort to litigation against us. The basis of such litigation could be existing patents or patents that issue in the future. Our failure to successfully defend against any claims that our product candidates or platform technology infringe the rights of third parties could also adversely affect our business. Failure to obtain any required licenses could restrict our ability to commercialize our products in certain territories or subject us to patent infringement litigation, which could result in us having to cease commercialization of our products and subject us to money damages in such territories.

It is also possible that we may fail to identify relevant patents or applications. For example, applications filed before November 29, 2000 and certain applications filed after that date that will not be filed outside the United States remain confidential until patents issue. Patent applications in the United States and elsewhere are published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Therefore, patent applications covering our products or platform technology could have been filed by others without our knowledge. Additionally, pending patent applications which have been published can, subject to certain limitations, be later amended in a manner that could cover our platform technologies, our products or the use of our products.

To avoid or settle potential claims with respect to any patent rights of third parties, we may choose or be required to seek a license from a third party and be required to pay license fees or royalties or both. These licenses may not be available on acceptable terms, or at all. Even if we or any future strategic partners were able to obtain a license, the rights may be nonexclusive, which could result in our competitors gaining access to the same intellectual property. Ultimately, we could be prevented from commercializing one or more of our products, or be forced to cease some aspect of our business operations, if, as a result of actual or threatened patent infringement claims, we are unable to enter into licenses on acceptable terms. This could harm our business significantly.

Defending against claims of patent infringement or misappropriation of trade secrets could be costly and time consuming, regardless of the outcome. Even if we were to ultimately prevail, or to settle at an early stage, such litigation could burden us with substantial unanticipated costs. In addition, litigation or threatened litigation could result in significant demands on the time and attention of our management team, distracting them from the pursuit of other business.

Intellectual property litigation may lead to unfavorable publicity that harms our reputation, and could result in unfavorable outcomes that could limit our research and development activities and/or our ability to commercialize certain products.

During the course of any patent litigation, there could be public announcements of the results of hearings, rulings on motions, and other interim proceedings in the litigation. If securities analysts or investors regard these announcements as negative, the perceived value of our products, programs, or intellectual property could be diminished. Moreover, if third parties successfully assert intellectual property rights against us, we might be barred from using certain aspects of our platform technology, or barred from developing and commercializing certain products. Prohibitions against using certain technologies, or prohibitions against commercializing certain products, could be imposed by a court or by a settlement agreement between us and a plaintiff. In addition, if we are unsuccessful in defending against allegations of patent infringement or misappropriation of trade secrets, we may be forced to pay substantial damage awards to the plaintiff. There is inevitable uncertainty in any litigation, including intellectual property litigation. There

can be no assurance that we would prevail in any intellectual property litigation, even if the case against us is weak or flawed. If litigation leads to an outcome unfavorable to us, we may be required to obtain a license from the patent owner to continue our research and development programs or to market our product(s). It is possible that the necessary license will not be available to us on commercially acceptable terms, or at all. This could limit our research and development activities, our ability to commercialize certain products, or both.

Table of Contents

Most of our competitors are larger than we are and have substantially greater resources. They are, therefore, likely to be able to sustain the costs of complex patent litigation longer than we could. In addition, the uncertainties associated with litigation could have a material adverse effect on our ability to raise the funds necessary to continue our internal research programs, conduct clinical trials, continue to in-license needed technology, or enter into strategic partnerships that would help us bring our product candidates to market.

In addition, any future patent litigation, interference or other administrative proceedings will result in additional expense and distraction of our personnel. An adverse outcome in such litigation or proceedings may expose us or any future strategic partners to loss of our proprietary position, expose us to significant liabilities, or require us to seek licenses that may not be available on commercially acceptable terms, if at all.

Confidentiality agreements with employees and third parties may not prevent unauthorized disclosure of trade secrets and other proprietary information.

In addition to patents, we rely on trade secrets, technical know-how, and proprietary information concerning our business strategy in order to protect our competitive position in the field of stem cell research and product candidate development. In the course of our research and development activities and other business activities, we often rely on confidentiality agreements to protect our proprietary information. Such confidentiality agreements are used, for example, when we talk to vendors of laboratory or clinical development services or potential strategic partners. In addition, each of our employees is required to sign a confidentiality agreement upon joining the Company. We take steps to protect our proprietary information, and our confidentiality agreements are carefully drafted to protect our proprietary interests. These confidentiality agreements may not effectively prevent disclosure of our technical know-how and proprietary information and may not provide an adequate remedy in the event of unauthorized disclosure of such technical know-how and proprietary information. In addition, others may independently discover trade secrets and proprietary information, and in such cases we would not be able to assert any trade secret rights against such parties. Costly and time-consuming litigation could be necessary to enforce and determine the scope of our proprietary rights, and failure to obtain or maintain trade secret protection could adversely affect our competitive business position.

There can be no guarantee that an employee or an outside party will not make an unauthorized disclosure of our proprietary confidential information. This might happen intentionally or inadvertently. It is possible that a competitor will make use of such information, and that our competitive position will be compromised, in spite of any legal action we might take against persons making such unauthorized disclosures.

Trade secrets are difficult to protect. Although we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors, or outside scientific collaborators might intentionally or inadvertently disclose our trade secret information to competitors. Enforcing a claim that a third party illegally obtained and is using any of our trade secrets is expensive and time consuming, and the outcome is unpredictable. In addition, courts outside the United States sometimes are less willing than U.S. courts to protect trade secrets. Moreover, our competitors may independently develop equivalent knowledge, methods and know-how.

Our research and development strategic partners may have rights to publish data and other information to which we have rights. In addition, we sometimes engage individuals or entities to conduct research relevant to our business. The ability of these individuals or entities to publish or otherwise publicly disclose data and other information generated during the course of their research is subject to certain contractual limitations. These contractual provisions may be insufficient or inadequate to protect our confidential information. If we do not apply for patent protection prior to such publication, or if we cannot otherwise maintain the confidentiality of our proprietary technology and other confidential information, then our ability to obtain patent protection or to protect our trade secret information may be jeopardized.

Intellectual property rights do not necessarily address all potential threats to our competitive advantage.

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations, and may not adequately protect our business, or permit us to maintain our competitive advantage. The following examples are illustrative:

Others may be able to make compounds that are the same as or similar to our product candidates but that are not covered by the claims of the patents that we may own or have exclusively licensed;

Table of Contents

We or our licensors or any future strategic partners might not have been the first to make the inventions covered by the issued patent or pending patent application that we may own or have exclusively licensed;

We or our licensors or any future strategic partners might not have been the first to file patent applications covering certain of our inventions;

Others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;

Others may be able to develop technologies around some of our issued patents without infringing such patents;

It is possible that our pending patent applications will not lead to issued patents;

Issued patents that we own or have exclusively licensed may not provide us with any competitive advantages, or may be held invalid or unenforceable, as a result of legal challenges by our competitors;

Our competitors might conduct research and development activities in countries where we do not have patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets;

We may not develop additional proprietary technologies that are patentable; and

The patents of others may have an adverse effect on our business.

Changes in U.S. patent law could diminish the value of patents in general, thereby impairing our ability to protect our products.

As is the case with other development stage biotechnology companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biotechnology and pharmaceutical industries involve both technological and legal complexity. Therefore, obtaining and enforcing patents is costly, time-consuming and inherently uncertain. In addition, Congress has passed patent reform legislation which provides new limitations on attaining, maintaining and enforcing intellectual property. Further, the Supreme Court has ruled on several patent cases in recent years, either narrowing the scope of patent protection available in certain circumstances or weakening the rights of patent owners in certain situations. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on decisions by the U.S. Congress, the federal courts, and the US PTO, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

If we are not able to obtain and enforce patent protection or other commercial protection for AV-101, the value of AV-101 will be harmed.

Commercial protection of AV-101, our small molecule drug candidate for neuropathic pain and other neurological conditions is important to our business. Our success related to AV-101 will depend in part on our or a potential collaborator’s ability to obtain and enforce potential patents and maintain our trade secrets and secure New Drug Product Exclusivity provided by the FDA under section 505(c)(3)(E) and 505(j)(5)(F) of the Federal Food, Drug, and Cosmetic Act.

Additional patents may not be granted, and potential U.S. patents, if issued, might not provide us with commercial benefit or might be infringed upon, invalidated or circumvented by others. The principle U.S. method of use patent and its foreign counterparts for AV-101 have expired. Although we have recently filed three new U.S. patent applications relating to AV-101, we or others with whom we may collaborate for the development and commercialization of AV-101 may choose not to seek, or may be unable to obtain, patent protection in a country that could potentially be an important market for AV-101.

Table of Contents

We may become subject to damages resulting from claims that we or our future employees have wrongfully used or disclosed alleged trade secrets of our employees' former employers.

Our ability to execute on our business plan will depend on the talents and efforts of highly skilled individuals with specialized training in the field of stem cell research and bioassay development, as well as medicinal chemistry and in vitro drug candidate screening and nonclinical and clinical development. Our future success depends on our ability to identify, hire and retain these highly skilled personnel during our development stage. We may hire additional highly skilled scientific and technical employees, including employees who may have been previously employed at biopharmaceutical companies, including our competitors or potential competitors, and who may have executed invention assignments, nondisclosure agreements and/or non-competition agreements in connection with such previous employment. As to such future employees, we may become subject to claims that we, or these future employees, have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their former employers. Litigation may be necessary to defend against these claims. If we fail in defending such claims, in addition to paying monetary damages, we may lose valuable intellectual property or personnel. A loss of key research personnel or their work product could hamper or prevent our ability to commercialize certain potential products, which could severely harm our business. Even if we are successful in defending against these claims, litigation could result in substantial costs and be a distraction to management.

Risks Related to the Offering

Purchasers in this Offering will experience immediate and substantial dilution in the book value of their investment.

If we successfully sell all securities registered by this Offering and investors exercise all warrants included in this Offering, new investors will contribute approximately _____% of the total amount of equity capital raised by us through the date of this Offering, and will own approximately 70% of the outstanding shares. In addition, we may have issued options, warrants or other derivative securities to acquire common stock at prices below the public offering price. To the extent outstanding options, warrants or other derivative securities are ultimately exercised or converted, or if we issue restricted stock to our employees under our equity incentive plans, there will be further dilution to investors who purchase shares in this Offering. In addition, if we issue additional equity securities or derivative securities, investors purchasing shares in this Offering will experience additional dilution. For a further description of the dilution that you will experience immediately after this Offering, see "Dilution."

We may allocate the net proceeds from this Offering in ways that differ from our estimates based on our current plans and assumptions discussed in the section titled "Use of Proceeds" and with which you may not agree.

The allocation of net proceeds of the offering set forth in the "Use of Proceeds" section of this prospectus represents our estimates based upon our current plans and assumptions regarding industry and general economic conditions, our future revenues and expenditures. The amounts and timing of our actual expenditures will depend on numerous factors, including market conditions, cash generated by our operations, business developments and related rate of growth. We may find it necessary or advisable to use portions of the proceeds from this offering for other purposes. Circumstances that may give rise to a change in the use of proceeds and the alternate purposes for which the proceeds may be used are discussed in the section in this prospectus entitled "Use of Proceeds". You may not have an opportunity to evaluate the economic, financial or other information on which we base our decisions on how to use our proceeds. As a result, you and other stockholders may not agree with our decisions. See "Use of Proceeds" for additional information.

Table of Contents

The number of shares of issued and outstanding common stock represents approximately 30% of our fully diluted shares of common stock. Additional issuances of shares of common stock upon conversion and/or exercise of convertible promissory notes, preferred stock, options to purchase common stock and warrants to purchase common stock will cause substantial dilution to existing stockholders.

At July 1, 2014, we had 25.5 million shares of common stock issued and outstanding. Up to an additional 61.0 million shares may be issued upon conversion of our Series A Preferred and all outstanding convertible promissory notes, and upon exercise of all outstanding options and warrants to purchase our common stock, which amount includes all reserves, resulting in a total of up to 86.5 million shares that may be issued and outstanding, assuming conversion of all outstanding convertible promissory notes, and exercise of all outstanding option and warrants to purchase our common stock. The issuance of any and all of the 61.0 million shares issuable upon exercise or conversion of our outstanding convertible securities will cause substantial dilution to existing stockholders and may depress the market price of our common stock.

You will experience future dilution as a result of future equity offerings, including in the event we consummate a financing involving the sale of our common stock to Autilion AG.

We may in the future offer additional shares of our common stock or other securities convertible into or exchangeable for our common stock, including up to 72.0 million shares of common stock to Autilion AG (Autilion) under the terms of an existing Securities Purchase Agreement by and between the Company and Autilion (Autilion Financing). While Autilion is in default under the Securities Purchase Agreement, we have not formally terminated the Agreement. Although no assurances can be given that Autilion will consummate the Autilion Financing, in the event we elect to close, or in the event we sell shares of common stock or other securities convertible into shares of our common stock in the future, additional and substantial dilution will occur. In addition, investors purchasing shares or other securities in the future could have rights superior to investors in the Offering.

There may be additional issuances of shares of preferred stock in the future.

Following approval by our stockholders in October 2011, our Articles of Incorporation permit us to issue up to 10.0 million shares of preferred stock and our board of directors has authorized the issuance of 500,000 shares of Series A Preferred, all of which shares are currently outstanding. In addition, our board of directors has authorized the creation of a new series of preferred stock, to be designated Series B Convertible Preferred Stock, for issuance promptly following consummation of the Offering upon conversion of the Platinum Notes. Our board of directors could authorize the issuance of additional series of preferred stock in the future and such preferred stock could grant holders preferred rights to our assets upon liquidation, the right to receive dividends before dividends would be declared to holders of our common stock, and the right to the redemption of such shares, possibly together with a premium, prior to the redemption of the common stock. In the event and to the extent that we do issue additional preferred stock in the future, the rights of holders of our common stock could be impaired thereby, including without limitation, with respect to liquidation.

The market price for our shares may decline following the implementation of our Stock Consolidation.

We will affect a reverse split of our authorized, and issued and outstanding shares of common stock prior to consummation of the Offering at a ratio of one-for-twenty (the Stock Consolidation), pending review and acceptance of the Stock Consolidation from the Financial Industry Regulatory Authority (FINRA). No assurances can be given that the Stock Consolidation will have a long-term positive effect on the market price of our common stock. The market price of our common stock is based on factors that may be unrelated to the number of shares outstanding. These factors include our performance, general economic and market conditions and other factors, many of which are beyond our control. The market price for our post-split shares may not rise or remain constant in

proportion to the reduction in the number of pre-split shares outstanding before the Stock Consolidation. Accordingly, the total market capitalization of our common stock after the Stock Consolidation may be lower than the total market capitalization before the Stock Consolidation.

Table of Contents

There is no assurance that an active, liquid and orderly trading market will develop for our common stock or what the market price of our common stock will be and, as a result, it may be difficult for you to sell your shares of our common stock.

Since we became a publicly traded company in May 2011, there has been a limited public market for shares of our common stock on the OTCQB Markets (OTCQB). We do not yet meet the initial listing standards of the New York Stock Exchange, the NASDAQ Capital Market, or other similar national securities exchanges. Until our common stock is listed on a broader exchange, we anticipate that it will remain quoted on the OTCQB, another over-the-counter quotation system, or in the "pink sheets." In those venues, investors may find it difficult to obtain accurate quotations as to the market value of our common stock. In addition, if we fail to meet the criteria set forth in SEC regulations, various requirements would be imposed by law on broker-dealers who sell our securities to persons other than established customers and accredited investors. Consequently, such regulations may deter broker-dealers from recommending or selling our common stock, which may further affect liquidity. This could also make it more difficult to raise additional capital.

We cannot predict the extent to which investor interest in our company will lead to the development of a more active trading market on the OTCQB, whether we will meet the initial listing standards of the New York Stock Exchange, the NASDAQ Capital Market, or other similar national securities exchanges, or how liquid that market might become. We and the placement agent determined the Offering price of our common stock through negotiation. This price does not necessarily reflect the price at which investors in the market will be willing to buy and sell our shares following this Offering. If an active trading market does not develop, you may have difficulty selling any of the shares of our common stock that you buy. In addition, the trading price of our common stock may be highly volatile and could be subject to wide fluctuations in response to various factors, some of which are beyond our control. These factors include:

actual or anticipated quarterly variation in our results of operations or the results of our competitors;

announcements by us or our competitors of new commercial products, significant contracts, commercial relationships or capital commitments;

financial projections we may provide to the public, any changes to those projections, or our failure to meet those projections;

issuance of new or changed securities analysts' reports or recommendations for our stock;

developments or disputes concerning our intellectual property or other proprietary rights;

commencement of, or our involvement in, litigation;

market conditions in the biopharmaceutical and life sciences sectors;

failure to complete significant sales;

changes in legislation and government regulation;

public concern regarding the safety, efficacy or other aspects of our products;

entering into, changing or terminating collaborative relationships;

any shares of our common stock or other securities eligible for future sale;

any major change to the composition of our board of directors or management; and

general economic conditions and slow or negative growth of our markets.

Table of Contents

The stock market in general, and small biotechnology-based companies like ours in particular, has from time to time experienced volatility in the market prices for securities that often has been unrelated to the operating performance of the underlying companies. These broad market and industry fluctuations may adversely affect the market price of our common stock, regardless of our operating performance. In certain recent situations in which the market price of a stock has been volatile, holders of that stock have instituted securities class action litigation against such company that issued the stock. If any of our stockholders were to bring a lawsuit against us, the defense and disposition of the lawsuit could be costly and divert the time and attention of our management and harm our operating results. Additionally, if the trading volume of our common stock remains low and limited there will be an increased level of volatility and you may not be able to generate a return on your investment.

A significant portion of our total outstanding shares are restricted from immediate resale but may be sold into the market in the near future. Future sales of shares by existing stockholders could cause our stock price to decline, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares intend to sell shares, could reduce the market price of our common stock. Prior to this date of this prospectus, there has been a limited public market for shares of our common stock on the OTCQB. Future sales of substantial amounts of shares of our common stock, including up to 72 million shares of common stock to Autilion and shares otherwise issued or issuable upon the exchange or conversion of our preferred stock, conversion of convertible promissory notes and exercise of outstanding options and warrants for common stock, in the public market, or the possibility of these issuances and sales occurring, could cause the prevailing market price for our common stock to fall or impair our ability to raise equity capital in the future.

Our principal institutional stockholders may continue to have substantial control over us and could limit your ability to influence the outcome of key transactions, including changes in control.

Certain of our current institutional stockholders and their respective affiliates beneficially own approximately 46% of our outstanding capital stock, as beneficial ownership is defined by SEC rules and regulations. Accordingly, these stockholders may continue to have substantial influence over the outcome of corporate actions requiring stockholder approval, including the election of directors, any merger, consolidation or sale of all or substantially all of our assets or any other significant corporate transactions. These stockholders may also delay or prevent a change of control of us, even if such a change of control would benefit our other stockholders. The significant concentration of stock ownership may adversely affect the trading price of our common stock due to investors' perception that conflicts of interest may exist or arise. For information regarding the ownership of our outstanding stock by such stockholders, refer to "Principal Stockholders" elsewhere in this prospectus.

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock may depend in part on the research and reports that securities or industry analysts publish about us and our business. Securities and industry analysts do not currently, and may never, publish research on our company. If no or too few securities or industry analysts commence coverage of our company, the trading price for our stock would likely be negatively impacted. In the event securities or industry analysts initiate coverage, if one or more of the analysts who cover us downgrade our stock or publish inaccurate or unfavorable research about our business, our stock price would likely decline. In the event we obtain analyst coverage, we will not have any control of the analysts or the content and opinions included in their reports. If one or more equity research analysts cease coverage of our company or fail to publish reports on us regularly, demand for our stock could decrease, which in turn could cause our stock price or trading volume to decline.

-32-

Table of Contents

Our common stock may be considered a “penny stock.”

Since we became a publicly traded company in May 2011, our common stock has traded on the OTCQB at a price of less than $5.00 per share. The Securities and Exchange Commission (SEC) has adopted regulations which generally define a “penny stock” as an equity security that has a market price of less than $5.00 per share, subject to specific exemptions. To the extent that the market price of our common stock is less than $5.00 per share and, therefore, may be considered a “penny stock,” brokers and dealers effecting transactions in our common stock must disclose certain information concerning the transaction, obtain a written agreement from the purchaser and determine that the purchaser is reasonably suitable to purchase the securities. These rules may restrict the ability of brokers or dealers to sell our common stock and may affect your ability to sell shares of our common stock. In addition, as long as our common stock remains quoted only on the OTCQB, investors may find it difficult to obtain accurate quotations of the stock, and may find few buyers to purchase such stock and few market makers to support its price.

We have never paid dividends on our capital stock, and we do not anticipate paying any cash dividends in the foreseeable future.

We have paid no cash dividends on any of our classes of capital stock to date and currently intend to retain our future earnings, if any, to fund the development and growth of our business. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future. Any payment of cash dividends will depend upon our financial condition, contractual restrictions, financing agreement covenants, solvency tests imposed by corporate law, results of operations, anticipated cash requirements and other factors and will be at the discretion of our board of directors. Furthermore, we may incur indebtedness that may severely restrict or prohibit the payment of dividends.

We incur significant costs to ensure compliance with corporate governance, federal securities law and accounting requirements.

Since becoming a public company by means of a strategic reverse merger in 2011, we have been subject to the reporting requirements of the Securities Exchange Act of 1934, as amended (Exchange Act), which requires that we file annual, quarterly and current reports with respect to our business and financial condition, and the rules and regulations implemented by the SEC, the Sarbanes-Oxley Act of 2002, the Dodd-Frank Act, and the Public Company Accounting Oversight Board, each of which imposes additional reporting and other obligations on public companies. We have incurred and will continue to incur significant costs to comply with these public company reporting requirements, including accounting and related audit costs, legal costs to comply with corporate governance requirements and other costs of operating as a public company. These legal and financial compliance costs will continue to require us to divert a significant amount of money that we could otherwise use to achieve our research and development and other strategic objectives.

The filing and internal control reporting requirements imposed by federal securities laws, rules and regulations are rigorous and we may not be able to continue to meet them, resulting in a possible decline in the price of our common stock and our inability to obtain future financing. Certain of these requirements may require us to carry out activities we have not done previously and complying with such requirements may divert management’s attention from other business concerns, which could have a material adverse effect on our business, results of operations, financial condition and cash flows. Any failure to adequately comply with federal securities laws, rules or regulations could subject us to fines or regulatory actions, which may materially adversely affect our business, results of operations and financial condition.

In addition, changing laws, regulations and standards relating to corporate governance and public disclosure are creating uncertainty for public companies, increasing legal and financial compliance costs and making some activities

more time consuming. These laws, regulations and standards are subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices. We will continue to invest resources to comply with evolving laws, regulations and standards, however this investment may result in increased general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If our efforts to comply with new laws, regulations and standards differ from the activities intended by regulatory or governing bodies due to ambiguities related to their application and practice, regulatory authorities may initiate legal proceedings against us and our business may be adversely affected.

Table of Contents

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus includes forward-looking statements. All statements contained in this prospectus other than statements of historical fact, including statements regarding our future results of operations and financial position, our business strategy and plans, and our objectives for future operations, are forward- looking statements. The words “believe,” “may,” “estimate,” “continue,” “anticipate,” “intend,” “expect” and similar expressions are intended to identify forward-looking statements. We have based these forward- looking statements largely on our current expectations and projections about future events and trends that we believe may affect our financial condition, results of operations, business strategy, short-term and long-term business operations and objectives, and financial needs. These forward-looking statements are subject to a number of risks, uncertainties and assumptions, including those described in the “Risk Factors” section. Moreover, we operate in a very competitive and rapidly changing environment. New risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the future events and trends discussed in this prospectus may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements.

You should not rely upon forward-looking statements as predictions of future events. The events and circumstances reflected in the forward-looking statements may not be achieved or occur. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee future results, levels of activity, performance or achievements. We are under no duty to update any of these forward-looking statements after the date of this prospectus or to conform these statements to actual results or revised expectations. If we do update one or more forward-looking statements, no inference should be drawn that we will make additional updates with respect to those or other forward- looking statements.

Table of Contents

USE OF PROCEEDS

We estimate that the net proceeds to us from the sale of securities offered under this prospectus, after deducting the placement agent fees and our other estimated expenses, will be $ 13. 5 million, assuming we sell the maximum amount of common stock and warrants registered herein. However, this is a best efforts Offering with no minimum, and no assurances can be given that we will receive significant proceeds.

Each share of common stock will be sold at a price of $___ and will be accompanied by a five-year warrant to purchase up to one share of common stock for $____ per share. The common stock and warrants can only be purchased together in this Offering, but are immediately separable once purchased and will be issued separately. We will not receive proceeds from the warrants issued in connection with this Offering. I f a warrant holder elects to exercise the warrants issued in this Offering, we may also receive up to $___ of proceeds from the exercise of warrants. The Agent, however, will not receive any fee or commission on any cash received by the Company upon exercise of any warrants issued in connection with the Offering. We cannot predict when or if the warrants will be exercised and it is possible that the warrants may expire and never be exercised.

We expect to use the net proceeds from this Offering (including proceeds resulting from the exercise of warrants, if any) for research and development related to our drug discovery, drug rescue and development, and regenerative medicine programs, capital expenditures, extinguishment of indebtedness, and other general corporate purposes. Such indebtedness may include certain Subordinate Convertible Promissory Bridge Notes (Subordinate Notes). Under the terms of the Subordinate Notes, assuming the Offering results in gross proceeds to us of at least $10.0 million, the principal and accrued interest due thereunder, totaling approximately $2.5 million at July 1, 2014 (the Conversion Amount), automatically converts into securities substantially similar to those issued in connection with the Offering (Automatic Conversion). The number of shares of common stock and warrants to be issued in connection with the Automatic Conversion is determined by multiplying the Conversion Amount by 1.25, and dividing the resulting number by the price per share of common stock and warrants sold in the Offering. Notwithstanding the Automatic Conversion, holders of Subordinate Notes may elect to receive cash payment of their Subordinate Notes by delivering written notice to us of their election to receive cash within three business days after receiving written notification of our completion of sales resulting in gross proceeds of at least $10.0 million from the Offering. Assuming all holders of Subordinate Notes elect to receive cash rather than securities issuable in connection with the Automatic Conversion, we anticipate using approximately $2.5 million in proceeds from the Offering to pay, in full, all amounts due and payable under the terms of the Subordinate Notes.

(amounts in millions)	Assuming all holders of Subordinate Notes: elect to receive cash in lieu of Automatic Conversion	elect Automatic Conversion of Subordinate Notes
Assumed gross proceeds	$ 15.0	$ 15.0
Placement agent fees and estimated offering expenses	(1.5)	(1.5)
Net proceeds	13.5	13.5
Research and development:		
Drug rescue programs, development of customized human cellular assay systems for drug discovery and drug rescue, and exploratory nonclinical regenerative medicine programs	6.1	6.9
To extinguish, during the next twelve months, indebtedness related to prior research and development services, technology license fees and patent	1.9	1.9

prosecution and maintenance expenses				
New property, plant and equipment		0.5		0.5
Repayment of Subordinate Notes		2.5		-
Working capital and other general and administrative purposes, including payment of approximately $0.9 million of certain professional service accounts payable	$	2.5	$	4.2

If all holders of Subordinate Notes elect to receive cash in lieu of securities issuable in connection with the Automatic Conversion, and we receive maximum proceeds from this Offering, we expect such proceeds to provide funding for our operations for at least approximately 18 months. Pending other uses, we intend to invest our proceeds from the Offering in short-term investments or hold them as cash. We cannot predict whether the proceeds invested will yield a favorable return. Our management will have broad discretion in the use of the net proceeds from the Offering, and investors will be relying on the judgment of our management regarding the application of the net proceeds.

Table of Contents

DILUTION

If you invest in our common stock, and assuming no value attributable to the warrants, you will experience dilution immediately to the extent of the difference between the public offering price per share of our common stock and warrants you pay in this Offering, and the pro forma net tangible book value per share of our common stock immediately after this Offering. As of March 31, 2014, our pro forma net tangible book value (deficit) was approximately $____ million, or $____ per share of common stock. Pro forma net tangible book value per share (deficit) is determined by dividing our total tangible assets less total liabilities, by the number of outstanding shares of our common stock, assuming we issue the maximum amount of securities registered herein, and assuming all holders of Subordinate Notes automatically convert into shares of common stock and warrants substantially similar to those offered in connection with the Offering.

Dilution in pro forma net tangible book value (deficit) per share represents the difference between the amount per share paid by buyers of shares of our common stock in this Offering and the pro forma net tangible book value (deficit) per share of our common stock immediately following this Offering. After giving effect to the issuance of the maximum number of shares registered herein at an assumed Offering price of $____ per share, and after deducting the estimated Agent fees on the gross cash proceeds from the Offering and the non-accountable expense allowance, as well as estimated Offering expenses payable by us, our pro forma as adjusted net tangible book value (deficit) as of March 31, 2014, would have been approximately $____ million, or $____ per share of common stock. This data represents an immediate increase in pro forma net tangible book value of $____ per share to existing stockholders and an immediate dilution of $____ per share to new investors purchasing shares at the Offering price.
The following table illustrates the per share dilution to investors in this Offering:

Assumed public offering price per share	$	____
Historical net tangible book value (deficit) per share as of March 31, 2014		
Conversion of Subordinate Notes into common stock and warrants		
Pro forma net tangible book value (deficit) per share as of March 31, 2014	$	____
Increase in pro forma net tangible book value per share attributable to investors in this Offering		
Pro forma net tangible book value (deficit) per share as of March 31, 2014, as adjusted to give effect to this Offering	$	
Less: Pro forma as adjusted dilution per share to investors in this Offering	$	____

The following table shows, on the pro forma basis described above, the difference between existing stockholders and new investors in this Offering with respect to the number of shares of common stock purchased from us, the total consideration paid and the average price paid per share, before deducting estimated offering expenses payable by us.

Table of Contents

	Shares purchased		Total consideration		Average price per share
	Number	Percent	Amount (in thousands)	Percent	
Existing stockholders	_____	__%	$ _____	__%	$____
New investors (1)	_____	__%	$ _____	__%	$____
Total	_____	___%	$ _____	___%	$____

(1) Includes shares issuable upon exercise of the warrants registered herein.

The outstanding share information set forth above is as of March 31, 2014 and excludes, as of that date:

up to 30,000,000 shares of common stock issuable upon exercise of warrants being offered in this Offering;

4,249,271 shares of common stock issuable upon the exercise of outstanding options under our 1999 Stock Incentive Plan and 2008 Stock Incentive Plan;

735,200 shares of common stock reserved for issuance in connection with future grants under our stock 2008 Stock Incentive Plan;

17,095,633 shares of common stock reserved for issuance upon exercise of outstanding warrants, which have exercise prices ranging from $0.50 per share to $2.63 per share;

15,000,000 shares of common stock reserved for issuance upon the exchange of our Series A Preferred;

7,500,000 shares of common stock issuable upon the exercise of warrants issuable upon the exchange of Series A Preferred; and

shares of common stock reserved for issuance upon the exchange of newly created Series B Preferred, which Series B Preferred will be issued upon automatic conversion of the Platinum Notes, assuming gross proceeds from the Offering of at least $10.0 million. See “The Offering – Platinum Notes” on page 3 of this prospectus for a description of the Platinum Notes.

Table of Contents

CAPITALIZATION

The following table sets forth our capitalization as of March 31, 2014 that is derived from our audited financial information included elsewhere in this prospectus:

- on an actual basis; and
- on a pro forma basis giving effect to net proceeds from this Offering of approximately $15 million.

As of March 31, 2014 (Amounts in dollars)		Actual		Pro forma
Cash and cash equivalents	$	-	$	_____
Long-term debt, excluding current portion		4,784,500		_____
Stockholders' equity:				
Preferred stock, $0.001 par value, 10,000,000 shares authorized; 500,000 Series A Preferred shares authorized, 500,000 Series A Preferred shares issued and outstanding, actual;		500		_____
Common stock, $0.001 par value, 200,000,000 shares authorized; 26,210,185 shares issued, 23,486,877 outstanding, actual; 56,506,877 shares issued and 53,783,569 shares outstanding, pro forma		26,200		_____
Additional paid-in capital		61,976,500		_____
Treasury stock, at cost, 2,713,308 shares		(3,968,100)		_____
Note receivable from sale of common stock		(198,100)		_____
Accumulated deficit		(70,636,900)		_____
Total stockholders' deficit		(12,799,900)		_____
Total capitalization	$	(8,015,400)	$	_____

Common stock outstanding in the table above excludes the following shares as of March 31, 2014:

- up to 30,000,000 shares of common stock issuable upon exercise of warrants being offered in this Offering;
- 4,249,271 shares of common stock reserved for issuance upon the exercise of outstanding options under our 1999 Stock Incentive Plan and 2008 Stock Incentive Plan;
- 17,095,633 shares of common stock reserved for issuance upon exercise of outstanding warrants, which have exercise prices ranging from $0.50 per share to $2.63 per share;
- 7,500,000 shares of our common stock issuable upon the exercise of warrants issuable upon the exchange of our Series A Preferred; and
- shares of our common stock reserved for issuance upon the exchange of newly created Series B Preferred, which Series B Preferred will be issued upon automatic conversion of the Platinum Notes, assuming gross proceeds from the Offering of at least $10.0 million. See "The Offering – Platinum Notes" on page 3 of this prospectus for a description of the Platinum Notes.

Table of Contents

PLAN OF DISTRIBUTION

We have entered into a placement agency agreement, dated as of August__ , 2014, with Geller Biopharm (Geller Biopharm or Agent), a healthcare investment banking division of Financial West Group. Subject to the terms and conditions contained in the placement agency agreement, the Agent has agreed to act as the placement agent in connection with the sale of up to an aggregate of 30,000,000 (the Maximum Offering) shares of its common stock. For each share of common stock issued and sold by us, we shall issue and sell to the investors warrants to purchase up to one share of common stock at an exercise price of $__ per share. The Agent may engage selected dealers to assist in the placement of the securities offered hereby. The Agent is not purchasing or selling any securities offered by this prospectus, nor are they required to arrange the purchase or sale of any specific number or dollar amount of our securities. However, Geller Biopharm has agreed to use their best efforts to arrange for the sale of the securities offered hereby.

Investors wishing to participate in the Offering will be required to deliver an executed subscription agreement to the Agent and immediately available funds via wire transfer to Signature Bank, as escrow agent for the Company. All of the proceeds from the sale of the securities offered hereby will be deposited into an escrow account at the escrow agent. If the Company does not accept the subscription of an investor, all monies of such investor will be refunded promptly, without any earned interest, and without deduction for commissions or expenses, including costs of the escrow agent. The Offering period may continue until September 30, 2014 and may be extended by the Agent and us.

The escrow agent will notify the Agent when funds to pay for the securities offered hereby have been received. The Agent shall inform the escrow agent in writing of the name, address, and the tax identification number of the investor, the amount of securities subscribed for by such investor, and the aggregate dollar amount of such subscription. The Agent and the Company will provide written instructions to the escrow agent when to release funds. Upon closing, we will deliver to each investor delivering funds the number of shares of common stock and warrants purchased by such investor. If the conditions to this Offering are not satisfied or waived by the Agent, then all investor funds that were deposited into escrow will be returned promptly to the investors, without any earned interest, and without deduction for commissions or expenses, including costs of the escrow agent and this Offering will terminate. We will pay the escrow agent a fee in connection with the escrow services.

The placement agency agreement provides that the obligations of the Agent and the investors are subject to certain conditions precedent, including, among other things, the absence of any material adverse change in our business and the receipt of customary legal opinions, letters and certificates.

We currently anticipate that the closing of the sale of the common stock and warrants offered hereby will take place on or before September 30, 2014.

We have agreed to pay the Agent an aggregate fee equal to 8.0% of the gross cash proceeds (equivalent to 8.0% per share of the per share Offering price of $__) of this Offering and expect the net proceeds from this Offering to be approximately $ 13.5 million, assuming the sale of the maximum Offering amount, after deducting up to approximately $ 1,300,000 in placement agent fees and $200,000 for our estimated Offering expenses. We have also agreed to pay the Agent a fee equal to 1% of the gross proceeds as a non-accountable expense allowance and agreed to pay all expenses relating to the Offering, including all fees, expenses and disbursements relating to the registration, qualification or exemption of securities offered under the securities laws of foreign jurisdictions designated by the placement agent. Notwithstanding the foregoing, the Agent shall not be entitled to receive any fee or commission on any cash received by the Company upon exercise of any of the Warrants issued in the Offering.

We have paid an expense deposit of $10,000 to the Agent towards actual accountable expenses, which expenses will not exceed $20,000. The placement agency agreement, however, provides that in the event the Offering is terminated,

the $10,000 expense deposit paid to the Agent will be returned to the extent offering expenses are not actually incurred.

We have also agreed to pay the expenses relating to the Offering, including: (i) all fees incurred in clearing this Offering with FINRA; (ii) all fees, expenses and disbursements relating to the registration, qualification or exemption of securities offered under the securities laws of foreign jurisdictions designated by the Agent; (iii) upon successfully completing this Offering, up to $20,000 of the Agent's actual accountable expenses for the Offering (which, if the Offering is consummated, such amount reimbursed as an accountable expense shall offset an equal amount of the non-accountable expense reimbursement); and (iv) up to $80,000 of the Agent’s legal fees.

We have agreed to indemnify the Agent and certain other persons against certain liabilities, including civil liabilities under the Securities Act, and to contribute to payments that Agent may be required to make in respect of those liabilities.

The Agent has informed us that they will not engage in over-allotment, stabilizing transactions or syndicate covering transactions in connection with this Offering.

Table of Contents

Lock-Up Agreements

Pursuant to certain “lock-up” agreements, we, our named executive officers and directors, and certain of our stockholders have agreed, subject to certain exceptions, not to offer, sell, assign, transfer, pledge, contract to sell, or otherwise dispose of or announce the intention to otherwise dispose of, or enter into any swap, hedge or similar agreement or arrangement that transfers, in whole or in part, the economic risk of ownership of, directly or indirectly, engage in any short selling of any common stock or securities convertible into or exchangeable or exercisable for any common stock, whether currently owned or subsequently acquired, without the prior written consent of the representative, for a period of one hundred and eighty (180) days after the date of the placement agency agreement.

The lock-up period described in the preceding paragraph will be automatically extended if: (i) during the last 17 days of the restricted period, we issue an earnings release or announce material news or a material event; or (ii) prior to the expiration of the lock-up period, we announce that we will release earnings results during the 16-day period beginning on the last day of the lock-up period, in which case the restrictions described in the preceding paragraph will continue to apply until the expiration of the 18-day period beginning on the date of the earnings release, unless the representative waives this extension in writing.

Payments in Connection with Autilion AG

In the event the Offering is not consummated and we receive at least $25 million of funding from the Autilion Financing on or before December 31, 2014 , then we will be required to pay Geller Biopharm a financial advisory fee equal to $500,000. The financial advisory fee is only payable in the event the Offering is not consummated and we receive at least $25 million of funding from the Autilion Financing on or before December 31, 2014. In connection with the Autillion Financing, the Agent previously assisted the Company in preparation of Company presentations and advised the Company regarding its financial position and capitalization. The Agent has not received any securities of the Company or payments in connection with its advisory role and will not receive any such payment unless the Company does not consummate the Offering, and we receive at least $25 million of funding from the Autilion Financing or before December 31, 2014.

Electronic Offer, Sale and Distribution of Shares

A prospectus in electronic format may be made available on the websites maintained by one or more of the placement agents. Other than the prospectus in electronic format, the information on these websites is not part of, nor incorporated by reference into, this prospectus or the registration statement of which this prospectus forms a part, has not been approved or endorsed by us or the placement agents should not be relied upon by investors.

Other Relationships

From time to time in the ordinary course of business, the Agent or its affiliates may in the future engage in investment banking, commercial banking and/or other services with us and our affiliates for which they may in the future receive customary fees and expenses.

Table of Contents

DESCRIPTION OF SECURITIES

General

Our authorized capital stock consists of 200 million shares of our common stock, $0.001 par value per share, and 10.0 million shares of preferred stock, $0.001 par value per share. The following is a description of our common stock and certain provisions of our Articles, and our amended and restated bylaws (Bylaws), and certain provisions of Nevada law. This summary does not purport to be complete and is qualified in its entirety by the provisions of our Articles and our Bylaws, copies of which have been filed with the SEC as exhibits to our periodic filings under the Securities Exchange Act.

As of July 1, 2014, there were issued and outstanding, or reserved for issuance:

25,506,872 shares of common stock held by approximately 300 stockholders of record;

15,000,000 shares of common stock reserved for issuance upon exchange of our Series A Preferred held by one institutional investor;

4,227,357 shares of common stock reserved for issuance upon exercise of outstanding stock options under our 1999 Stock Incentive Plan and 735,200 shares of common stock reserved for future grants under our 2008 Stock Incentive Plan;

26,481,490 shares of common stock issuable upon exercise of outstanding warrants, including warrants to purchase 7,500,000 shares of common stock, which warrants are issuable upon exchange of our Series A Preferred for common stock;

shares of common stock reserved for issuance upon Automatic Conversion of the Subordinate Notes. See “Use of Proceeds” on page 43 of this prospectus for a description of the Subordinate Notes; and

shares of our common stock reserved for issuance upon the conversion of newly issued Series B Preferred, which Series B Preferred will be issued upon conversion of the Platinum Notes, assuming gross proceeds from the Offering of at least $10.0 million. See “The Offering – Platinum Notes” on page 3 of this prospectus for a description of the Platinum Notes.

Common Stock

Except as otherwise expressly provided in our Articles, or as required by applicable law, all shares of our common stock have the same rights and privileges and rank equally, share ratably and are identical in all respects as to all matters, including, without limitation, those described below. All outstanding shares of common stock are fully paid and nonassessable.

Voting rights

Each holder of our common stock is entitled to cast one vote for each share of common stock held on all matters submitted to a vote of stockholders. Cumulative voting for election of directors is not allowed under our Articles, which means that a plurality of the shares voted can elect all of the directors then outstanding for election. Except as otherwise provided under Nevada law or our Articles, and Bylaws, on matters other than election of directors, action on a matter is approved if the votes cast favoring the action exceed the votes cast opposing the action

Table of Contents

Dividend rights

The holders of outstanding shares of our common stock are entitled to receive dividends out of funds legally available, if our board of directors, in its discretion, determines to issue dividend, and only at the times and in the amounts that our board of directors may determine. Our board of directors is not obligated to declare a dividend. We have not paid any dividends in the past and we do not intend to pay dividends in the foreseeable future. See “Dividend Policy” for more information.

Liquidation rights

Upon our liquidation, dissolution or winding-up, the holders of our common stock will be entitled to share equally, identically and ratably in all assets remaining, subject to the prior satisfaction of all outstanding debt and liabilities and the preferential rights and payment of liquidation preferences, if any, on any outstanding shares of preferred stock.

No preemptive or similar rights

Our common stock is not entitled to is not subject to conversion, redemption, sinking fund or similar provisions regarding the common stock.

Preferred Stock

We are authorized, subject to limitations prescribed by Nevada law, to issue up to 10.0 million shares of preferred stock in one or more series, to establish from time to time the number of shares to be included in each series and to fix the designation, powers, preferences and rights of the shares of each series and any of its qualifications, limitations or restrictions. Our board of directors can increase or decrease the number of shares of any series, but not below the number of shares of that series then outstanding, without any further vote or action by our stockholders. Our board of directors may authorize the issuance of preferred stock with voting or conversion rights that could adversely affect the voting power or other rights of the holders of the common stock. The issuance of preferred stock, while providing flexibility in connection with possible acquisitions and other corporate purposes, could, among other things, have the effect of delaying, deferring or preventing a change in control of the Company and may adversely affect the market price of our common stock and the voting and other rights of the holders of our common stock.

Series A Preferred

General

In December 2011, our board of directors authorized the creation of a series of up to 500,000 shares of Series A Preferred. At July 1, 2014, there were 500,000 shares of Series A Preferred outstanding. By agreement with the sole holder thereof, each share of Series A Preferred is exchangeable at the option of the holder into thirty (30) shares of our common stock. The Series A Preferred ranks prior to our common stock for purposes of liquidation preference.

Dividend rights

The Series A Preferred has no separate dividend rights. However, whenever the board of directors declares a dividend on the common stock, each holder of record of a share of Series A Preferred, or any fraction of a share of Series A Preferred, on the date set by the board of directors to determine the owners of the common stock of record entitled to receive such dividend (Record Date) shall be entitled to receive out of any assets at the time legally available therefor, an amount equal to such dividend declared on one share of common stock multiplied by the number of shares of common stock into which such share, or such fraction of a share, of Series A Preferred could be exchanged on the

Record Date.

Table of Contents

Voting rights

Except with respect to transactions upon which the Series A Preferred shall be entitled to vote separately as a class, the Series A Preferred has no voting rights. The common stock into which the Series A Preferred is exchangeable shall, upon issuance, have all of the same voting rights as other issued and outstanding shares of our common stock.

Liquidation rights

In the event of the liquidation, dissolution or winding up of our affairs, after payment or provision for payment of our debts and other liabilities, the holders of Series A Preferred then outstanding shall be entitled to receive, out of our assets, if any, an amount per share of Series A Preferred calculated by taking the total amount available for distribution to holders of all of our outstanding common stock before deduction of any preference payments for the Series A Preferred, divided by the total of (x), all of the then outstanding shares of our common stock, plus (y) all of the shares of our common stock into which all of the outstanding shares of the Series A Preferred can be exchanged before any payment shall be made or any assets distributed to the holders of the common stock or any other junior stock.

Series B Preferred

General

Our board of directors authorized the creation of the Series B Preferred in order to provide for the conversion of certain promissory notes held by Platinum totaling approximately $4.1 million in principal and accrued interest at July 1, 2014 (Outstanding Balance) into Series B Preferred upon consummation of the Offering. We anticipate filing the certificate of designations for the Series B Preferred immediately prior to consummation of the Offering.

The number of shares of Series B Preferred to be issued will be calculated based on the liquidation preference for the Series B Preferred, which shall equal the Outstanding Balance as of the date of consummation of the Offering, divided by the lesser of (i) $.50 and (ii) the per-share common stock price sold in the Offering.

By agreement with the sole holder thereof, each share of Series B Preferred will be exchangeable at the option of the holder into shares of our common stock at the price per-share of common stock sold in the Offering. The Series B Preferred will rank prior to our common stock for purposes of liquidation preference.

Dividend rights

The Series B Preferred will have no separate dividend rights. However, whenever the board of directors declares a dividend on the common stock, each holder of record of a share of Series B Preferred, or any fraction of a share of Series B Preferred, on the date set by the board of directors to determine the owners of the common stock of record entitled to receive such dividend (Record Date) shall be entitled to receive out of any assets at the time legally available therefor, an amount equal to such dividend declared on one share of common stock multiplied by the number of shares of common stock into which such share, or such fraction of a share, of Series B Preferred could be exchanged on the Record Date.

Table of Contents

Voting rights

Except with respect to transactions upon which the Series B Preferred shall be entitled to vote separately as a class, the Series B Preferred shall have no voting rights. The common stock into which the Series B Preferred shall be exchangeable shall, upon issuance, have all of the same voting rights as other issued and outstanding shares of our common stock.

Liquidation rights

In the event of the liquidation, dissolution or winding up of our affairs, after payment or provision for payment of our debts and other liabilities, the holders of Series B Preferred then outstanding shall be entitled to receive, out of our assets, if any, an amount per share of Series B Preferred calculated by taking the total amount available for distribution to holders of all of our outstanding common stock before deduction of any preference payments for the Series B Preferred, divided by the total of (x), all of the then outstanding shares of our common stock, plus (y) all of the shares of our common stock into which all of the outstanding shares of the Series B Preferred can be exchanged before any payment shall be made or any assets distributed to the holders of the common stock or any other junior stock.

Options

As of July 1, 2014, we had options to purchase 4,227,357 shares of our common stock outstanding pursuant to our 1999 Plan and our 2008 Plan.

Warrants

We are offering warrants to purchase up to 30,000,000 shares of our common stock to purchasers in this offering. Each warrant entitles the holder thereof to purchase up to one share of common stock at an exercise price of $____ per share. The warrants are exercisable immediately upon issuance and have an exercise term equal to five years.

As of July 1, 2014, warrants to purchase 18,981,490 shares of our common stock were outstanding, excluding warrants to purchase 7,500,000 shares of common stock issuable in connection with the exchange of our Series A Preferred for common stock.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is Registrar and Transfer Company. The transfer agent’s address is 10 Commerce Drive, Cranford, NJ 07016.

Table of Contents

Securities Authorized for Issuance Under Equity Compensation Plans as of July 1, 2014

	Number of securities to be issued upon exercise of outstanding options, warrants and rights (a)	Weighted-average exercise price of outstanding options, warrants and rights (b)	Number of securities remaining available for future issuance under equity compensation plans [excluding securities reflected in column (a)]
Equity Compensation plans approved by security holders	3,964,800	$ 0.50	735,200
Equity Compensation plans not approved by security holders	262,557	0.58	-
Total	4,227,537	$ 0.50	735,200

SHARES ELIGIBLE FOR FUTURE SALE

Prior to this Offering, there has a limited public market for shares of our common stock. Future sales of substantial amounts of shares of our common stock, including sales of shares issued upon the conversion of outstanding convertible promissory notes, exchange of outstanding preferred stock and exercise of outstanding options and warrants, in the public market after this Offering or the possibility of these issuances and sales occurring, could cause the prevailing market price for our common stock to fall or impair our ability to raise equity capital in the future.

Upon the completion of this Offering, based on the number of shares outstanding as of July 1, 2014, we will have approximately 131.2 million shares of common stock outstanding, assuming exercise of all outstanding options and warrants, including exercise of the warrants sold in connection with the Offering, and conversion of our preferred stock and convertible promissory notes. Of these outstanding shares, all shares of common stock sold by us in this Offering, and the shares of common stock issuable upon exercise of warrants offered in this Offering, will be freely tradable in the public market without restriction or further registration under the Securities Act, and shares of common stock held by our affiliates, as that term is defined in Rule 144 under the Securities Act, may only be sold in compliance with the limitations described below. All remaining shares of common stock, and all shares of Series A Preferred and Series B Preferred outstanding after this Offering, will be deemed restricted under the Federal securities laws.

Rule 144

In general, under Rule 144 as currently in effect, a person who is not deemed to have been one of our affiliates for purposes of the Securities Act at any time during the 90 days preceding a sale and who has beneficially owned the shares proposed to be sold for at least six months, including the holding period of any prior owner other than our affiliates, is entitled to sell those shares without complying with the manner of sale, volume limitation or notice provisions of Rule 144, subject to compliance with the public information requirements of Rule 144. If such person has beneficially owned the shares proposed to be sold for at least one year, including the holding period of any prior owner other than our affiliates, then that person is entitled to sell those shares without complying with the requirements of Rule 144, subject to the availability of current public information about us.

In general, under Rule 144 as currently in effect, our affiliates or persons selling shares on behalf of our affiliates are entitled to sell upon the expiration of the lock-up agreements described above, within any three month period, a

number of shares that does not exceed the greater of:

- 1% of the number of shares of common stock then outstanding; or
- the average weekly trading volume of the common stock during the four calendar weeks preceding the filing of a notice on Form 144 with respect to such sale.

Sales under Rule 144 by our affiliates or persons selling shares on behalf of our affiliates are also subject to certain manner of sale provisions and notice requirements and to the availability of current public information about us.

Table of Contents

BUSINESS

Overview

We are a stem cell company headquartered in South San Francisco, California, focused on producing mature, non-transformed, functional, adult human cells, and novel, customized cellular assay systems incorporating them, for our drug, discovery, drug rescue and regenerative medicine programs. We believe better cells lead to better medicines™ and that the key to making better cells is precisely controlling the differentiation of human pluripotent stem cells, which are the building blocks of all cells of the human body. Our stem cell technology platform, which we refer to as Human Clinical Trials in a Test Tube, is based on a combination of proprietary and exclusively licensed technologies for controlling the differentiation of human pluripotent stem cells (hPSCs) and producing the multiple types of mature, non-transformed, functional, adult human cells that we use, or plan to use, to reproduce complex human biology and disease and assess, in vitro, the potential therapeutic benefits and safety risks of new drug candidates.

We have used our hPSC-derived human cardiomyocytes (VSTA-CMs™) to design and develop CardioSafe 3D™, our novel, customized in vitro bioassay system for predicting potential cardiotoxicity of new drug candidates, including drug candidates included in our drug rescue programs. We believe CardioSafe 3D is more comprehensive and clinically predictive than the hERG assay, currently the only in vitro cardiac safety assay required by FDA Guidelines. Our hPSC-derived hepatocytes (VSTA-heps™), highly-functional, non-transformed, mature human hapatocytes, are the foundation of LiverSafe 3D™, our novel, customized bioassay system for predicting potential liver toxicity of new drug candidates, including potential drug metabolism issues and adverse drug-drug interactions. We believe our VSTA-heps have more functionally useful life-span in culture than primary (cadaver) hepatocytes used in FDA-required drug metabolism studies and overcome numerous problems related to commercially-available primary hepatocytes currently used in FDA-required in vitro hepatocyte assays for drug metabolism, such as limited supply, unknown health status of the donor and genetic differences. We believe our Human Clinical Trials in a Test Tube platform, anchored by VSTA-CMs, VSTA-heps, CardioSafe 3D and LiverSafe 3D, offer a new paradigm for evaluating and predicting potential heart and liver toxicity of new drug candidates, including new drug candidates included in our drug rescue programs, early in development, long before costly, high risk human clinical trials.

We believe using CardioSafe 3D and LiverSafe 3D for our drug rescue programs is the highest-value near term commercial application of the human cells we produce and the novel, customized bioassay systems we have designed and developed. Our drug rescue activities are focused on producing new, safer variants of still-promising new drug candidates previously discovered, optimized and tested for efficacy by pharmaceutical companies and others but terminated before FDA approval due to unexpected cardiac toxicity or liver toxicity. We refer to these still-promising new drug candidates as Drug Rescue Candidates™. Our drug rescue strategy involves leveraging CardioSafe 3D and LiverSafe 3D to attempt to significantly reduce the toxicity that caused Drug Rescue Candidates to be terminated, and bring new, proprietary safer versions of them back into development as promising new drug candidates. We refer to the new, safer versions of Drug Rescue Candidates we are focused on producing as Drug Rescue Variants™. We anticipate that each lead Drug Rescue Variant optimized in vitro for safety and efficacy will be suitable as a new drug development program, either internally or under a revenue-generating out-license arrangement with a pharmaceutical or biotechnology company. We have identified and screened using our CardioSafe 3D assays multiple Drug Rescue Candidates. We are now prepared to launch multiple CardioSafe 3D drug rescue programs with proceeds from this offering

Our Drug Rescue Strategy

We believe the pre-existing public domain knowledge base supporting the therapeutic and commercial potential of our Drug Rescue Candidates will provide us with a valuable head start as we launch our drug rescue programs. Leveraging the substantial prior investments by global pharmaceutical companies and others in discovery,

optimization and in vitro efficacy validation of Drug Rescue Candidates is an essential component of our drug rescue strategy.

Our current drug rescue emphasis is on Drug Rescue Candidates discontinued prior to FDA market approval due to unexpected cardiac safety concerns. By using CardioSafe 3D assay platform to enhance our understanding of the cardiac liability profile of Drug Rescue Candidates, biological insight not previously available when the Drug Rescue Candidates were originally discovered, optimized for efficacy and developed, we believe we can demonstrate in vitro proof-of-concept as to the efficacy and safety of Drug Rescue Variants earlier in development and with substantially less investment in discovery, in vitro efficacy optimization and preclinical development than was required of pharmaceutical companies and others prior to their decision to terminate the Drug Rescue Candidates.

Table of Contents

The key elements of our current CardioSafe 3D drug rescue strategy are as follows:

identify potential Drug Rescue Candidates with heart safety issues utilizing drug discovery and development information available in the public domain through open source, licensed databases, and published patents, as well as through our strategic relationships with our drug rescue and scientific advisors and consultants, including Synterys, Inc. and Cato Research Ltd., our providers of contract medicinal chemistry and contract clinical development services and regulatory expertise, respectively;

leverage substantial prior research and development investments made by global pharmaceutical companies and others to support the therapeutic and commercial potential of Drug Rescue Candidates, as important criteria for selection of Drug Rescue Candidates and potential lead Drug Rescue Variants;

use our CardioSafe 3D assay platform to enhance our understanding of the cardiac liability profile of Drug Rescue Candidates, important and more comprehensive biological insights not previously available when the Drug Rescue Candidates were originally discovered, optimized and developed by pharmaceutical companies;

leverage our internal knowledgebase about each Drug Rescue Candidate's specific chemistry to design and produce, with our contract medicinal chemistry collaborator, a portfolio of novel potential lead Drug Rescue Variants for each Drug Rescue Candidate;

use CardioSafe 3D and pre-existing in vitro efficacy models to assess the efficacy and cardiac safety of potential Drug Rescue Variants and identify and validate a lead Drug Rescue Variant; and

internally develop optimized and validated lead Drug Rescue Variant or out-license them to a pharmaceutical or biotechnology company in a revenue-generating agreements providing for the development, market approval and commercial sale of the Drug Rescue Variant.

CardioSafe 3D Drug Rescue Candidates

We have identified the following CardioSafe 3D Drug Rescue Candidates:

Drug Rescue Candidate	Indication	Developer	Terminated	Mechanism
VSTA-1C05	Cancer	Pharma	Phase 1/2	Aurora kinase inhibitors
VSTA-1A08	Cancer , inflammatory disease and respiratory disease	Biotech	Preclinical	PI3 kinase -delta inhibitor
VSTA-2A21	Dementia	Pharma	Preclinical	Nicotinic a7 receptors
VSTA-4E15	Type 2 Diabetes and obesity	Pharma	Post-NDA	Insulin sensitizer; PPAR gamma agonist

We have assessed, and established a CardioSafe 3D cardiotoxicity profile for, VSTA-1C05, VSTA-4E15 and VSTA-2A21. Together with our pre-existing CardioSafe 3D validation data, we believe the results of such

CardioSafe 3D assessments demonstrate that CardioSafe 3D can correctly distinguish varying levels of cardiotoxicity between new drug candidates, including Drug Rescue Candidates and Drug Rescue Variants. We plan to establish a CardioSafe 3D cardiotoxicity profile for VSTA-1A08 and additional CardioSafe 3D Drug Rescue Candidates , following consummation of this Offering.

Table of Contents

As reflected in the table below, we plan to launch multiple CardioSafe 3D drug rescue programs following consummation of this Offering. Our initial goal with respect to each Drug Rescue Candidate will be to produce a lead Drug Rescue Variant with demonstrated in vitro proof of concept (POC). In this context, POC means that the lead Drug Rescue Variant, Drug Rescue Candidate, demonstrates both (i) equal or superior efficacy in the same, or a similar, in vitro efficacy assay used by the initial developer of the Drug Rescue Candidate prior to termination for safety reasons and (ii) significant reduction of concentration dependent cardiotoxicity in CardioSafe 3D.

Potential CardioSafe 3D Drug Rescue Variant Pipeline

Drug Rescue Variant Program	Projected Program Launch	Projected Preclinical POC in vitro (1)	Projected Preclinical POC in vivo (2)
VSTA-DRV1	Q4 2014	Q3 2015	Q4 2015
VSTA-DRV2	Q4 2014	Q3 2015	Q4 2015
VSTA-DRV3	Q1 2015	Q4 2015	Q1 2016
VSTA-DRV4	Q1 2015	Q4 2015	Q1 2016

(1) Drug Rescue Variant, as compared to the Drug Rescue Candidate, demonstrates, (i) equal or superior efficacy in the same or similar pre-termination in vitro efficacy assay (s) used by the original developer of the Drug Rescue Candidate to optimize its efficacy and (ii) substantial reduction of concentration dependent cardiotoxicity in our CardioSafe 3D cardiac safety assays.

(2) Drug Rescue Variant demonstrates (i) safety, determined by a substantial reduction of concentration dependent cardiotoxicity in the in vitro assay(s) and/or in vivo animal model used by the original developer, resulting in discontinuation of the Drug Rescue Candidate and (ii) efficacy, determined using the in vitro assays and/or in vivo animal model(s) used by the original developer to support the pre-termination IND application for the Drug Rescue Candidate.

We believe our exclusive focus on Drug Rescue Candidates with established therapeutic and commercial potential, and our ability to build on that valuable head start with our novel biological and electrophysiological insight regarding cardiac effects of new drug candidates that we can generate with CardioSafe 3D, will help us and our medicinal chemistry partner produce and optimize Drug Rescue Variants without incurring many of the high costs and risks typically inherent in new drug discovery and development. Although we plan to continue to identify Drug Rescue Candidates in the public domain, we may also seek to acquire rights to Drug Rescue Candidates not available to us in the public domain by entering into contractual arrangements with third-parties.

Strategic Development and Commercialization of Drug Rescue Variants

We believe many pharmaceutical companies are experiencing, and will continue to experience, critical research and development productivity issues, as measured by their lack of, or very low number of, FDA-approved products each year during the past decade. In 2013, the U.S. pharmaceutical industry invested over $51 billion in research and development, while the FDA only approved 34 new treatments, including 27 medications approved by the FDA's Center for Drug Evaluation and Research (CDER). Considering CDER only approved an average of 26 medications per year between 2004 and 2012, we expect the disparity between annual spending on research and development by the U.S. pharmaceutical industry and the number of medications approved by CDER to continue.

As a result of research and development productivity issues and diminishing product pipelines, as well as generic competition for established products that are no longer patent protected, we believe there is and will continue to be a critical need among pharmaceutical companies to acquire or in-license the new, potentially safer Drug Rescue

Variants we are focused on developing, including companies that originally discovered, developed and ultimately discontinued the Drug Rescue Candidates we select for our drug rescue programs.

Table of Contents

Once we achieve in vitro proof of concept (POC) as to the efficacy and safety of a lead Drug Rescue Variant, we intend to announce the results of our internal POC studies and, at that time, consider whether to further develop it internally or seek to out-license it to a pharmaceutical company, including, potentially, the company that developed the Drug Rescue Candidate. If we decide to out-license a lead Drug Rescue Variant to a pharmaceutical company, through a form of license arrangement we believe is generally accepted in the pharmaceutical industry, we anticipate that the pharmaceutical company will be responsible for all subsequent development, manufacturing, regulatory approval, marketing and sale of the Drug Rescue Variant and that we will receive licensing revenue through payments to us from the license upon signing the license agreement, achievement of development and regulatory milestones, and, if approved and marketed, upon commercial sales, although no assurances can be given that the terms of such a beneficial arrangement will be available or offered to us.

Regenerative Medicine and Drug Discovery

Although we believe the best and most valuable near term commercial application of our stem cell technology platform is for small molecule drug rescue, we also believe stem cell technology-based drug discovery and regenerative medicine has the potential to transform healthcare in the U.S. over the next decade by altering the fundamental mechanisms of disease. Upon completion of this Offering, we intend to explore opportunities to leverage our stem cell technology platform, our expertise in human biology, differentiation of human pluripotent stem cells to develop functional adult human cells and tissues involved in human disease, including blood, bone, cartilage, heart, liver and insulin-producing pancreatic beta-islet cells, and our expertise in designing and developing novel, customized biological assay systems with the cells we produce, for regenerative medicine purposes, with emphasis on developing novel human disease models for discovery of small molecule drugs with regenerative and therapeutic potential. Among our key objectives will be to assess our regenerative medicine opportunities through exploratory nonclinical POC studies.

AV-101 for Neuropathic Pain, Epilepsy and Depression

With $8.8 million of grant funding awarded from the U.S. National Institutes of Health (NIH), we have successfully completed Phase 1 development of AV-101. AV-101, also known as “L-4-chlorokynurenine” and “4-Cl-KYN”, is an orally-available, non-sedating small molecule prodrug candidate aimed at the multi-billion dollar neurological disease and disorders market, including neuropathic pain, a serious and chronic condition causing pain after an injury or disease of the peripheral or central nervous system, epilepsy, depression and Parkinson’s disease. Our AV-101 IND application on file at the FDA covers clinical development for neuropathic pain. However, we believe the Phase 1 AV-101 safety studies we have completed to date will support development of AV-101 for multiple indications, including epilepsy, depression and Parkinson’s disease. Upon completion of this Offering, we intend to seek potential opportunities for further clinical development and commercialization of AV-101 for neuropathic pain, epilepsy, depression and Parkinson’s disease, either on our own or through one strategic partnering arrangements. In the event that we successfully complete one or more strategic partnering arrangements for AV-101, we plan to use the net proceeds from such arrangement(s) to expand our stem cell technology-based drug rescue and regenerative medicine programs.

Scientific Background

Stem Cell Basics

Stem cells are the building blocks of all cells of the human body. They have the potential to develop into many different mature cell types. Stem cells are defined by a minimum of two key characteristics: (i) their capacity to self-renew, or divide in a way that results in more stem cells; and (ii) their capacity to differentiate, or turn into mature, specialized cells that make up tissues and organs. There are many different types of stem cells that come from

different places in the body or are formed at different times throughout our lives, including pluripotent stem cells and adult or tissue-specific stem cells, which are limited to differentiating into the specific cell types of the tissues in which they reside. We focus exclusively on human pluripotent stem cells.

Table of Contents

Human pluripotent stem cells (hPSCs) can be differentiated into all of the more than 200 types of cells in the human body, can be expanded readily, and have diverse medical research, drug discovery, drug rescue, drug development and therapeutic applications. We believe hPSCs can be used to develop numerous cell types, tissues and customized assays that can mimic complex human biology, including heart and liver biology for drug rescue.

Human pluripotent stem cells are either embryonic stem cells (hESCs) or induced pluripotent stem cells (iPSCs). Both hESCs and iPSCs have the capacity to be maintained and expanded in an undifferentiated state indefinitely. We believe these features make them highly useful research and development tools and as a source of normal, functionally mature cell populations. We use these mature cells as the basis to design and develop our novel, customized bioassay systems to test the safety and efficacy of new drug candidates in vitro. These cells also have potential for diverse regenerative medicine applications.

Human Embryonic Stem Cells

According to the NIH, human embryonic stem cells are derived from excess embryos that develop from eggs that have been fertilized in an in vitro fertilization (IVF) clinic and then donated for research purposes with the informed consent of the parental donors after a successful IVF procedure. Human embryonic stem cells are not derived from eggs fertilized in a woman's body. Human ESCs are isolated when the embryo is approximately 100 cells, well before organs, tissues or nerves have developed.

Human embryonic stem cells have the potential to both self-renew and differentiate. They undergo increasingly tissue-restrictive developmental decisions during their differentiation. These "fate decisions" commit the hESCs to becoming only a certain type of mature, functional cells and ultimately tissues. At one of the first fate decision points, hESCs differentiate into epiblasts. Although epiblasts cannot self-renew, they can differentiate into the major tissues of the body. This epiblast stage can be used, for example, as the starting population of cells that develop into millions of blood, heart, muscle, liver and insulin-producing pancreatic beta-islet cells, as well as neurons. In the next step, the presence or absence of certain growth factors, together with the differentiation signals resulting from the physical attributes of the cell culture techniques, induce the epiblasts to differentiate into neuroectoderm or mesendoderm cells. Neuroectoderm cells are committed to developing into cells of the skin and nervous systems. Mesendoderm cells are precursor cells that differentiate into mesoderm and endoderm. Mesoderm cells develop into muscle, bone and blood, among other cell types. Endoderm cells develop into the internal organs such as the heart, liver, pancreas and intestines, among other cell types.

Induced Pluripotent Stem Cells

It is also possible to obtain hPSC lines from individuals without the use of embryos. Induced pluripotent stem cells are adult cells, typically human skin or fat cells that have been genetically reprogrammed to behave like hESCs by being forced to express genes necessary for maintaining the pluripotential properties of hESCs. Although researchers are exploring non-viral methods, most early iPSCs were produced by using various viruses to express three or four genes required for the immature pluripotential property similar to hESCs. It is not yet precisely known, however, how each gene actually functions to induce cellular pluripotency, nor whether each of the three or four genes is essential for this reprogramming. Although hESCs and iPSCs are believed to be similar in many respects, including their pluripotential ability to form all cells in the body and to self-renew, scientists do not yet know whether they differ in clinically significant ways or have the same ability to self-renew.

Table of Contents

Although there are remaining questions in the field about the lifespan, clinical utility and safety of iPSCs, we believe the biology and differentiation capabilities of hESCs and iPSCs are likely to be comparable for drug rescue purposes. There are, however, specific situations in which we may prefer to use one or the other type of hPSC. For example, we may prefer to use iPSCs for potential drug discovery applications based on the relative ease of generating iPSCs from:

- individuals with specific inheritable diseases and conditions that predispose the individual to respond differently to drugs; or

- individuals with specific variations in genes that directly affect drug levels in the body or alter the manner or efficiency of their metabolism, breakdown and/or elimination of drugs.

Because they can significantly affect the therapeutic and/or toxic effects of drugs, these genetic variations have an impact on drug discovery and development. We believe iPSC technologies may allow the rapid and efficient generation of hPSCs from individuals with specific genetic variations. These hPSCs might then be used to produce cells to model specific diseases and genetic conditions for drug discovery and drug rescue purposes.

Proprietary Stem Cell Differentiation Protocols

Over fifteen years of research, together with Dr. Gordon Keller, our co-founder and Chair of our Scientific Advisory Board, we have developed proprietary differentiation protocols covering key conditions involved in the differentiation of hPSCs into multiple types of mature human cells. The human cells generated by following these proprietary differentiation protocols are integral to our Human Clinical Trials in a Test Tube platform. We believe they support more clinically-predictive in vitro bioassay systems than animal testing or cellular assays currently used in drug discovery and development. Our strategic technology licenses from National Jewish Health in Denver, the Icahn School of Medicine at Mount Sinai in New York and the University Health Network in Toronto relate to proprietary stem cell differentiation protocols developed by Dr. Keller and involve precisely-coordinated temporal and quantitative conditions and interaction of biological molecules including the following:

- specific growth and differentiation factors used in the tissue culture medium, applied in specific combinations, at critical concentrations, and at critical times unique to each desired human cell type;

- the experimentally controlled regulation of developmental genes, which is critical for determining what differentiation path a human cell will take; and

- biological markers characteristic of precursor cells, which are committed to becoming specific human cells and tissues, and which can be used to identify, enrich and purify the desired mature human cell type.

We believe our Human Clinical Trials in a Test Tube platform will allow us to assess the toxicity profile of Drug Rescue Variants and other new drug candidates for a wide range of diseases and conditions with greater speed and precision than nonclinical surrogate safety models most often currently used in drug development.

Table of Contents

Growth Factors that Direct and Stimulate the Differentiation Process

The proprietary and licensed technologies underlying our Human Clinical Trials in a Test Tube platform allow us to direct and stimulate the differentiation process of hPSCs. As an example, for hESCs, the epiblast is the first stage in differentiation. One biological factor that controls the first fate decision of the epiblast is the relative concentrations of serum growth factors and activin, a protein involved in early differentiation and many cell fate decisions. Substituting explicit amounts of defined growth factors in place of ill-defined animal serum, and adding the optimal amount of activin is an important step in inducing the reproducible development of functional cells and, in our view, is essential for the development of a robust, efficient, and reproducible model of human cellular differentiation suitable for drug rescue. The use of activin in these applications is core to many of the claims in the patent applications underlying our licensed hPSC technology. Replacing activin with continuous exposure to ill-defined and variable animal serum results in an inefficient and variable differentiation of the human heart, liver, blood and cells of other organs. See "Intellectual Property – Icahn School of Medicine at Mount Sinai Exclusive Licenses."

In addition to activin, Dr. Keller's studies have identified a number of other growth and developmental factors that play important roles in the differentiation of hESCs. Some of the patents and patent applications underlying our licensed hPSC technology are directed to the use of a variety of specific growth factors that increase the efficiency (yield) and reproducibility of the hPSC differentiation process. We have exclusive rights to certain patents and patent applications with claims relating to growth factor concentrations for hESC differentiation that we believe are core and essential for drug rescue and development. See "Intellectual Property – Icahn School of Medicine at Mount Sinai Exclusive Licenses" and "National Jewish Health Exclusive Licenses."

Developmental Genes that Direct and Stimulate the Stem Cell Differentiation Process

For the purpose of creating our Human Clinical Trials in a Test Tube platform, we further control the differentiation process by controlling regulation of key developmental genes. By studying natural organ and tissue development, researchers have identified many genes that are critical to the normal differentiation, growth and functioning of tissues of the body. We engineer hESCs in a way that enables us to regulate genes that have been identified as critical to control and direct the normal development of specific types of cells. We can then mimic human biology in a way that allows us to turn on and off the expression of a selected gene by the addition of a specific compound to a culture medium. By adding specific compounds, we have the ability to influence the expression of key genes that are critically important to the normal biology of the cell.

Cell Purification Approaches

The proprietary protocols we have licensed and developed internally for our Human Clinical Trials in a Test Tube platform also establish specific marker genes and proteins which can be used to identify, enrich, purify, and study important populations of intermediate precursor cells that have made specific fate decisions and are on a specific developmental pathway towards a certain type of functionally mature cell. These proprietary protocols enable a significant increase in the efficiency, reproducibility, and purity of final cell populations. For example, we are able to isolate millions of purified specific precursor cells which, together with a specific combination of growth factors, develop full culture wells of functional, beating human cardiomyocytes. Due to their functionality and purity, we believe these cell cultures are ideal for drug rescue.

3D "Micro-Organ" Culture Systems

In addition to standard two-dimensional (2D) cultures which work well for some cell types and cellular assays, the proprietary hPSC technologies underlying our Human Clinical Trials in a Test Tube platform enable us to grow large numbers of normal, non-transformed, mature human cells to produce novel in vitro 3D "micro-organ" culture systems.

For example, for CardioSafe 3D, we grow large numbers of normal, non-transformed, human heart cells in vitro in 3D micro-organ culture systems. The 3D micro-organ cultures induce the cells to grow, mature, and develop 3D cell networks and tissue structures. We believe these 3D cell networks and structures more accurately reflect the structures and biology inside the human body than traditional flat, 2D, single cell layers grown on plastic, that are widely used by pharmaceutical companies today. We believe that the more representative human biology afforded by the 3D system will yield responses to drug candidates that are more predictive of human drug responses.

Table of Contents

Medicinal Chemistry

Medicinal chemistry involves designing, synthesizing, or modifying a small molecule compound or drug suitable for clinical development. It is a highly interdisciplinary science combining organic chemistry, biochemistry, physical chemistry, computational chemistry, pharmacology, and statistics. The combination of medicinal chemistry with the proprietary and licensed hPSC technologies underlying our Human Clinical Trials in a Test Tube platform are core components of our drug rescue business model. Working with our strategic contract medicinal chemistry partner, Synterys, Inc., we are focused on using our stem cell biology to generate a pipeline of effective and safe Drug Rescue Variants of once-promising company drug candidates in a more efficient and cost-effective manner than the processes currently used for drug development.

CardioSafe 3D

The limitations of current preclinical drug testing systems used by pharmaceutical companies contribute to the high failure rate of drug candidates. According to articles published in the Journal of Applied Toxicology, Stem Cell Research and Current Opinion in Cardiology, unexpected cardiotoxicity is one of the top two major safety-related reasons for failure of both drugs and drug candidates. Incorporating novel in vitro assays using hPSC-derived cardiomyocytes (hPSC-CMs) early in preclinical development offers the potential to improve clinical predictability, decrease development costs, and avoid adverse patient effects, late-stage clinical termination, and product recall from the market.

With our proprietary stem cell differentiation technology, we produce fully-functional, non-transformed hPSC-CMs, which we refer to as VSTA-CMs™, at a level of purity greater than 95% and with normal ratios of all important cardiac cell types. Importantly, our hPSC-CM differentiation protocols do not involve either genetic modification or antibiotic selection. This is important because genetic modification and antibiotic selection can distort the ratio of cardiac cell types and have a direct impact on the ultimate results and clinical predictivity of assays that incorporate hPSC-CMs produced in such a manner. In addition to normal expression all of the key ion channels of the human heart (calcium, potassium and sodium) and various cardiomyocytic markers of the human heart, our VSTA-CMs function reliably in all of our CardioSafe 3D cardiac toxicity assays, screening for both direct cardiomyocyte cytotoxicity and arrhythmogenesis (or development of irregular beating patterns). We believe CardioSafe 3D is sensitive, stable, reproducible and capable of generating data enabling a more accurate prediction of the in vivo cardiac effects of Drug Rescue Variants and other new drug candidates than is possible with existing preclinical testing systems, particularly the hERG assay.

Limited clinical predictivity of the FDA-required hERG assay

The hERG assay, which uses either transformed hamster ovary cells or human kidney cells, is currently the only in vitro cardiac safety assay required by FDA Guidelines (ICH57B). We believe the clinical predictivity of the hERG assay is limited because it assesses only a single cardiac ion channel - the hERG potassium ion channel. It does not assess any other clinically relevant cardiac ion channels, including calcium, non-hERG potassium and sodium ion channels. Also, importantly, the hERG assay does not assess the normal interaction between these ion channels and their regulators. In addition, the hERG assay does not assess clinically-relevant cardiac biological effects associated with cardiomyocyte viability , including apoptosis and other forms of cytotoxicity, as well as energy, mitochondria and oxidative stress. As a result of its limitations, results of the hERG assay can lead to false negative and false positive predictions regarding the cardiac safety of new drug candidates.

Broad clinical predictivity of CardioSafe 3D

As noted above, we have developed and validated two clinically-relevant functional components of our CardioSafe 3D screening system to assess multiple categories of cardiac toxicities, including both direct cardiomyocyte cytotoxicity and arrhythmogenesis (or development of irregular beating patterns). The first functional component of CardioSafe 3D consists of a suite of five fluorescence or luminescence based high-throughput hPSC-CM assays. These five CardioSafe 3D assays measure the following important drug-induced cardiac biological effects:

1. cell viability;
2. apoptosis;
3. mitochondrial membrane depolarization;
4. oxidative stress; and
5. energy metabolism disruption.

Table of Contents

These five CardioSafe 3D biological assays were correlated to reported clinical results using reference compounds known to be cardiotoxic in humans versus compounds known to be safe in humans. These reference compounds were representative of eight different drug classes, including:

1. ion channel blockers: amiodarone, nifedipine;
2. hERG trafficking blockers: pentamidine, amoxapine;
3. -1 adrenoreceptors: doxazosin;
4. protein and DNA synthesis inhibitors: emetine;
5. DNA intercalating agents: doxorubicin;
6. antibiotics: ampicillin, cefazolin;
7. NSAID: aspirin; and
8. kinase inhibitors: staurosporine.

This suite of five CardioSafe 3D cytotoxicity assays provided measurement of cardiac drug effects with high sensitivity that are consistent with the expected cardiac responses to each of these compounds. Based on our results, we believe CardioSafe 3D provides valuable and far more comprehensive bioanalytical tools for both assessing the effects of pharmaceutical compounds on cardiac cytotoxicity than the hERG assay and can elucidate for us and our medicinal chemistry partner specific mechanisms of cardiac toxicity, thereby laying what we believe is a novel and advantageous foundation for our drug rescue programs.

The other component of our CardioSafe 3D assay system is a sensitive and reliable medium throughput multi-electrode array (MEA) assay developed to predict drug-induced alterations of electrophysiological function of the human heart, representing an integrated assessment of not only hERG potassium ion channel activity analogous to the FDA-mandated hERG assay but, in addition, non-hERG potassium channels, and calcium channels and sodium channels, which are well beyond the scope of the hERG assay. Functional electrophysiological assessment is a key component of CardioSafe 3D, and has been validated with reported clinical results involving twelve drugs, each with known toxic or non-toxic cardiac effects in humans. The twelve clinical correlation study compounds are as follows:

1. One FDA-approved drug (aspirin) without cardiac liability to serve as a negative control;
2. Five FDA-approved drugs (astemizole, sotalol, cisapride, terfenadine and sertindole) that were withdrawn from the market due to heart toxicity concerns;
3. Five FDA-approved drugs (fexofenadine, nifedipine, verapamil, lidocaine and propranolol) that have certain measurable non-toxic cardiac effects consistent with clinical experience with such compounds. Note: fexofenadine is a non-cardiotoxic drug variant of terfenadine; and
4. One research compound (E-4031) failed in Phase I human clinical study before being discontinued due to inducing heart arrhythmias.

We have validated that CardioSafe 3D is capable of assessing important electrophysiological activity of drugs or new drug candidates, including spike amplitude, beat period and field potential duration. Our CardioSafe 3D MEA assay, which we refer to as ECG in a test tube™, was reproducible and consistent with the known human cardiac effects of all twelve compounds studied, based on the mechanisms of action and dosage of the compounds. For instance, by using CardioSafe 3D, we were able to distinguish between the arrhythmogenic cardiac effects of terfenadine (Seldane™), withdrawn by the FDA due to cardiotoxicity, and the cardiac effects of the closely structurally-related compound, fexofenadine (Allegra™), a safe variant of terfenadine, which remains on the market. We believe our correlation data demonstrate that CardioSafe 3Dprovides valuable and more comprehensive bioanalytical tools for in vitro cardiac safety screening than the hERG assay. We believe CardioSafe 3D will contribute to our efficient and rapid identification of novel, potentially safer Drug Rescue Variants in our programs.

Table of Contents

CardioSafe 3D, going far beyond the hERG assay

The table below reflects the broad cardiotoxicity screening capabilities CardioSafe 3D, which we believe go far beyond what is possible to assess in vitro using the FDA-required hERG assay:

Detects cardiac effects mediated by:	hERG assay	CardioSafe 3D™
hERG potassium ion channels	ü	ü
Other potassium ion channels		ü
Calcium ion channels		ü
Sodium ion channels		ü
Interactions between ion channels		ü
Channel regulatory proteins		ü
Cell viability		ü
Apoptosis		ü
Mitochondria		ü
Energy		ü
Oxidative Stress		ü

CardioSafe 3D assessment of kinase inhibitor-induced cardiotoxicity

To further evaluate the potential of CardioSafe 3D to predict cardiac toxicity of drug candidates in vitro, including Drug Rescue Variants, we have assessed cardiac effects induced by small molecule kinase inhibitors (KIs), which belong to a new category of drugs that have revolutionized cancer therapy due to decreased systemic toxicity and an increased anti-tumor cell specific effect compared to classic cancer drugs. Since 1998, the FDA has approved numerous small molecule KIs for cancer therapy. However, many of these FDA-approved KIs have been implicated in causing serious adverse cardiac events in patients which were not identified during drug development using traditional preclinical testing systems.

In our KI-induced cardiotoxicity study, we evaluated well-known anti-cancer KIs with CardioSafe 3D, some of which are FDA-approved and have been documented as cardiotoxic. This important validation set of anti-cancer KI compounds is as follows:

1. Inhibitors of growth factor receptors: sunitinib, axitinib, imatinib, dasatinib, sorafenib, erlotinib, lapatinib, tyrphostin and AG1478;
2. Inhibitors of the mTOR pathway: everolimus, temsirolimus;
3. Inhibitors of cell cycle regulators: tozasertib, barasertib, alvocidib;
4. Inhibitors of the PI3K pathway : perifosine, LY294002, XL765;
5. Inhibitors of the MEK pathway: PD325901, AZD6264; and
6. Inhibitors of the JAK and other pathways: lestaurtinib.

Our validation data indicate that CardioSafe 3D successfully detected cardiotoxicity induced by each of the representative compounds, consistent with adverse cardiac events observed in the clinic. CardioSafe 3D assay system is able to distinguish between cardiotoxic and safe compounds, and even as between those compounds which inhibit the same kinase pathways. For instance, both sunitinib and axitinib inhibit VEGFR, PDGFR and c-Kit pathways, whereas our CardioSafe 3D assays indicate that sunitinib is cardiotoxic and axitinib is safe, which is consistent with the reported clinical outcomes.

Table of Contents

Importantly, the CardioSafe 3D profile of each KI provided us clues to the potential biological mechanism(s) causing cardiac cytotoxicity. For example, cardiac cytotoxicity induced by perifosine was most potent for producing apoptotic responses, while imatinib was most potent for producing oxidative stress. In addition, no cardiac toxicity or alteration in electrophysiology was detected with drugs that do not have a cardiac liability, emphasizing the specificity of CardioSafe 3D. Having information on the biological pathways associated with the cardiac cytotoxic effects of compounds provides important clues for novel medicinal chemistry approaches and compound modifications for our CardioSafe 3D drug rescue programs.

Another example of the capability of our CardioSafe 3D assay system enabling the sensitive measurement of drug effects that are consistent with reported clinical responses are the results with sunitinib and dasatinib. CardioSafe 3D correctly identified that both compounds would cause QT prolongation, arrhythmia, and/or altered contraction rates, which are consistent with clinical observations.

We believe our CardioSafe 3D correlation data demonstrate that CardioSafe 3D will improve clinical predictivity as a more comprehensive and clinically-relevant in vitro cardiac safety assay system than the hERG assay, helping not only to identify potential cardiac toxicities early in development, but also to discover important potential biological mechanisms of cardiac cytotoxicity. We believe the results of our CardioSafe 3D validation studies indicate that CardioSafe 3D may be effectively used to identify novel Drug Rescue Variants with reduced cardiotoxicity by providing more accurate and timely indications of alterations in electrophysiological activity, as well as a more clinically relevant assessment of potential cardiac biological effects of drug candidates contributing to cardiac cytotoxicity, than animal models or the hERG assay currently used by pharmaceutical companies. We believe the results of our CardioSafe 3D validation studies support the central premise of our drug rescue business model: by using our hPSC-derived human heart and liver cell bioassay systems at the front end of the drug development process, we have the opportunity to take advantage of substantial prior investment by pharmaceutical companies and others in drug discovery and in vitro efficacy optimization of still-promising drug candidates that have been terminated prior to FDA approval due to unexpected heart or liver toxicity concerns.

LiverSafe 3D

We refer to the highly-functional, non-transformed, mature hPSC-derived hepatocytes we produce as VSTA-heps™. VSTA-heps are the foundation of LiverSafe 3D, a powerful new in vitro hepatotoxicity assay system that we believe goes a step beyond in vitro assays using commercially-available primary (human cadaver cell-based) hepatocytes. By combining the flexibility of an in vitro, non-transformed human hepatocyte-based assay system with genetically-consistent, functionally-reliable, and essentially unlimited production based on hPSCs, VSTA-heps, can be maintained in a healthy state for much longer than the primary hepatocytes used in FDA-required drug metabolism assays, greatly enhancing the reliability and predictability of our hepatotoxicity testing for our drug rescue programs.

Until now, reliable human cell-based hepatotoxicity screening platforms have been difficult to establish for high throughput drug development with currently available primary hepatocyte systems. Commercially-available primary (cadaver) hepatocytes are in short supply, are genetically variable, functionally inconsistent, and have a short lifespan in culture, during which they rapidly lose their drug metabolizing capabilities and develop signs of cellular stress. Commercially-available primary hepatocytes also have significant batch-to-batch genetic and functional activity that varies widely batch-to-batch. Primary hepatocytes are derived from individuals with significant genetic differences, unknown differences in health status, and widely different drug exposures, each potentially contributing significant but unquantifiable effects on hepatocyte function, resulting in very large unpredictable ranges of drug metabolism activity. Consequently, it is difficult to maintain reproducible quantitative measurements in drug testing assays using currently available primary (cadaver) hepatocyte assays. This leads to limitations in the quality, reliability, and clinical predictivity of the results and conclusions drawn assays based on primary (cadaver) hepatocytes.

We believe VSTA-heps overcome the foregoing limitations of primary hepatocytes. Our VSTA-heps are derived from the same hPSC line, are genetically identical, normal, non-transformed (that is, not tumor-derived) human cells capable of being produced in essentially unlimited supply. Importantly, VSTA-heps can be indefinitely produced and, we believe, frozen for storage into large, uniform, quality-controlled cell banks.

Table of Contents

The table below reflects important characteristics of VSTA-heps compared to commercially-available primary hepatocytes used in FDA-required drug metabolism studies:

Characteristics of in vitro hepatocyte assays:	Primary hepatocytes	VSTA-heps™
Human cells	ü	ü
Liver enzyme activity	ü	ü
Within batch reproducibility	ü	ü
Batch-to-batch reproducibility		ü
Long term culture		ü
Maintenance of function in culture		ü
Parental cells can be expanded into large batches		ü
Uniform genetic background between batches		ü
Uniform donor health status between batches		ü
Gene “reporters” can be genetically inserted		ü

VSTA-heps and CYP3A4 enzyme expression for drug metabolism

In the past, the challenge to using hPSC-derived hepatocytes has been differentiating the stem cells into mature hepatocytes that express a full complement of functional drug metabolizing enzymes, nuclear receptors, and transporters at least as well as primary hepatocytes. While many groups have taken on this challenge in recent years, published reports indicate that current hPSC differentiation protocols yield immature hepatocytes, especially with respect to extremely low expression of certain key adult drug metabolizing enzymes, such as CYP3A4. CYP3A4 is a critical liver enzyme responsible for metabolizing approximately one-third of the FDA-approved drugs currently available on the market. It is an important and well-accepted functional gene found almost exclusively in mature, adult hepatocytes. CYP3A4 is the key functional marker that we have used to optimize our VSTA-hep differentiation cultures for LiverSafe 3D. We believe our optimized LiverSafe 3D assay system enables us to generate more mature hPSC-derived hepatocytes than are currently available from others in the field and that our LiverSafe 3D system provides the unique ability to specifically select for mature CYP3A4-expressing human hepatocytes.

We developed LiverSafe 3D using hPSC differentiation protocols adapted from the laboratory of our co-founder, Dr. Gordon Keller, and our proprietary hPSC cell line, 3A4BLA. This 3A4BLA cell line is a hESC line that contains a humanized BLA “reporter” that is placed in the CYP3A4 gene in a manner resulting in the expression of BLA only in cells that also express CYP3A4. This allows us to visualize by fluorescence cells that express CYP3A4 based on expression of the BLA reporter. By producing a cell line capable of tracking CYP3A4 expression, we have been able to optimize our hPSC differentiation protocols to increase expression of mature hepatocyte markers and drug metabolizing enzymes and to enrich for CYP3A4-expressing cells by cell sorting. However, even in the absence of cell sorting, our LiverSafe 3D hepatocyte populations contain greater than 80% albumin-positive cells and greater than 40% CYP3A4-positive cells, with CYP3A4 mRNA expression reaching levels nearly 60-fold higher than side-by-side 38-week human fetal liver controls. Our VSTA-heps secrete urea and albumin, functional markers of hepatocytes, at levels that exceed commercially-available primary (cadaver) hepatocytes. They also store both glycogen and lipids, which are additional characteristics required of functional, mature adult hepatocytes. Importantly, expression of fetal liver markers decreases over the time course of maturation of our VSTA-heps. This transition to a more mature state with decreased fetal gene expression is expected and essential for the production of adult functional hepatocytes, but it has rarely been reported by others in publications describing their hPSC-derived hepatocytes. With the addition of cell sorting, our VSTA-heps can be highly enriched for CYP3A4-BLA-positive cells, with CYP3A4 message in the positive cell population reaching greater than 30% that of an adult human liver pool control. To our knowledge, this level of CYP3A4 expression exceeds levels reported by others in the literature.

Table of Contents

The most important capabilities of LiverSafe 3D relate to "Phase I" and "Phase II" drug metabolism, which are functional characteristics of mature adult hepatocytes. We have validated these capabilities of LiverSafe 3D by demonstrating its ability to metabolize known substrates, such as testosterone, and its ability to respond properly to known inducers of Phase I-mediated CYP3A4 metabolism, such as rifampicin. Moreover, our VSTA-heps demonstrate Phase II-mediated testosterone metabolism levels that exceed commercially-available primary hepatocytes. These functional characteristics of mature adult hepatocytes are critical to the development of a reliable and clinically predictive hepatotoxicity screening platform for our drug rescue programs. We are currently focused on expanding our panel of validation assays and compounds to include more P450 substrates, inducers, and inhibitors, as well as adapting the cellular toxicity assays that have been developed for our CardioSafe 3D assay system to our LiverSafe 3D assay system and to apply specific functional screening, such as albumin and urea secretion assays.

We believe LiverSafe 3D with VSTA-heps offers the capability of producing a genetically-identical, renewable, and reproducible hepatotoxicity assay system for drug rescue and development that provides advantages over in vitro assays using commercially-available primary hepatocytes. In addition, it offers the ability to produce hepatocyte assays that contain common genetic variations in drug metabolizing genes that are expressed in subsets of individuals, and therefore drug development. We have demonstrated that our VSTA-heps, even in the absence of cell sorting, secrete adult hepatocyte levels of albumin and urea and contain greater than 40% CYP3A4-positive cells, historically difficult to achieve in hPSC differentiation cultures. The proprietary 3A4BLA cell line component of LiverSafe 3D allows us the unique opportunity to enrich CYP3A4-positive cells, resulting in CYP3A4 expression reaching greater than 30% of an adult human liver pool, and to the best of our knowledge, a level higher than described in current literature. Most importantly, for drug rescue and development purposes, our VSTA-heps are the foundation of LiverSafe 3D and metabolize known substrates and respond to known inducers in a manner expected only of mature adult hepatocytes, paving the way for our final validation of LiverSafe 3D system as a novel, clinically-relevant hepatotoxicity assay system that can improve clinical predictivity, decrease the cost of drug development, reduce reliance on live animal studies, and improve drug safety.

AV-101

We have successfully completed Phase I development of AV-101, also known as "L-4-chlorokynurenine" or "4-Cl-KYN". AV-101 is a prodrug candidate for the treatment of neuropathic pain, epilepsy and depression. Our AV-101 IND application on file at the FDA covers our Phase I clinical development for neuropathic pain. However, we believe the safety studies done in Phase I development of AV-101 will support development of AV-101 for other indications, including epilepsy, depression and potentially other neurological diseases, such as Parkinson's disease.

The NIH has awarded us $8.8 million of grant funding for our preclinical and Phase 1 clinical development of AV-101. AV-101 is currently available for out-license to a strategic corporate partner. During 2014, we plan to seek strategic partnering arrangements for further clinical development and commercialization of AV-101 for neuropathic pain, epilepsy, depression and Parkinson's disease.

AV-101 is an orally-available, non-sedating prodrug candidate that is converted in the brain into an active metabolite, 7-chlorokynurenic acid (7-Cl-KYNA), which regulates the N-methyl-D-aspartate (NMDA) receptors. 7-Cl-KYNA is a synthetic analogue of kynurenic acid, a naturally occurring neural regulatory compound, and is one of the most potent and selective blockers of the regulatory GlyB-site of the NMDA receptor. In preclinical studies, AV-101 has very good oral bioavailability, is rapidly and efficiently transported across the blood-brain barrier, and is converted into 7-Cl-KYNA in the brain and spinal cord, preferentially, at the site of seizures and potential neural damage.

The effect of AV-101 on chronic neuropathic pain due to inflammation and nerve damage was assessed in rats by using the Chung nerve ligation model. AV-101 effects were compared to either saline and MK-801, or gabapentin (NeurontinTM) as positive controls. Similar to the therapeutic effects seen in the acute formalin and thermal pain

models, AV-101 had a positive effect on chronic neuropathic pain in the Chung model that were greater than two (2) standard deviations of the control, with no adverse behavioral observations. As expected, MK-801 and gabapentin also demonstrated reduced pain readouts in the Chung model. The effects observed by AV-101 in both the acute and chronic neuropathic pain model systems was dose dependent, and was not associated with any side effects at the range of doses administered. Preclinical AV-101 data demonstrated the potential clinical utility of AV-101 as an analgesic.

Table of Contents

Strategic Transactions and Relationships

Strategic collaborations are a cornerstone of our corporate development strategy. We believe that our strategic outsourcing and sponsorship of application-focused research gives us flexible access to medicinal chemistry, hPSC research and development, manufacturing, clinical development and regulatory expertise at a lower overall cost than developing and maintaining such expertise internally. In particular, we collaborate with the types of third parties identified below for the following functions:

- academic research institutions, such as the University Health Network (UHN) and Duke University, for hPSC technology research and development;

- contract medicinal chemistry companies, such as Synterys, Inc., to analyze Drug Rescue Candidates and design, produce and analyze Drug Rescue Variants; and

- contract clinical development and regulatory organizations (CROs), such as Cato Research, Ltd., for regulatory expertise and clinical development support.

McEwen Centre for Regenerative Medicine, University Health Network

UHN in Ontario, Canada is a major landmark in Canada's healthcare system. UHN is one of the world's largest research hospitals, with major research in transplantation, cardiology, neurosciences, oncology, surgical innovation, infectious diseases and genomic medicine.

The McEwen Centre for Regenerative Medicine (McEwen Centre) is a world-renowned center for stem cell biology and regenerative medicine and a stem cell research facility affiliated with UHN. Dr. Gordon Keller, our co-founder and Chairman of our Scientific Advisory Board, is Director of the McEwen Centre. Dr. Keller's lab is considered one of the leaders in successfully applying principles from the study of developmental biology of many animal systems to the differentiation of pluripotent stem cell systems, resulting in reproducible, high-yield production of human heart, liver, blood and vascular cells. The results and procedures developed in Dr. Keller's lab are often quoted and used by academic scientists worldwide.

In September 2007, we entered into a long-term sponsored stem cell research and development collaboration with UHN. In December 2010, we extended the collaboration to September 2017. The primary goal of this ten-year collaboration is to leverage the stem cell research, technology and expertise of Dr. Gordon Keller to develop and commercialize industry-leading human pluripotent stem cell differentiation technology and bioassay systems for drug rescue and development and regenerative cell therapy applications. This sponsored research collaboration builds on our existing strategic licenses from National Jewish Health and the Icahn School of Medicine at Mount Sinai to certain pluripotent stem cell technologies developed by Dr. Keller, and is directed to diverse human pluripotent stem cell-based research projects, including, as expanded and amended, strategic projects related to drug rescue and regenerative medicine. See "Sponsored Research Collaborations and Intellectual Property Rights – University Health Network, McEwen Centre for Regenerative Medicine, Toronto, Ontario", "Intellectual Property – National Jewish Health Exclusive Licenses" and "Intellectual Property – Icahn School of Medicine at Mount Sinai Exclusive Licenses."

Cardiac Safety Research Consortium

We have joined the Cardiac Safety Research Consortium (CERC) as an Associate Member. The CSRC, which is sponsored in part by the FDA, was launched in 2006 through an FDA Critical Path Initiative Memorandum of Understanding with Duke University to support research into the evaluation of cardiac safety of medical products. CSRC supports research by engaging stakeholders from industry, academia, and government to share data and

expertise regarding several areas of cardiac safety evaluation, including novel stem cell-based approaches, from preclinical through post-market periods.

Table of Contents

Cardiac Safety Technical Committee of the Health and Environmental Sciences Institute – FDA's CIPA Initiative

We have also joined the Cardiac Safety Technical Committee, Cardiac Stem Cell Working Group, and Proarrhythmia Working Group of the Health and Environmental Sciences Institute (HESI) to help advance, among other goals, the FDA's Comprehensive In Vitro Proarrhythmia Assay (CIPA) initiative, which is focused on developing innovative preclinical systems for cardiac safety assessment during drug development. HESI is a global branch of the International Life Sciences Institute (ILSI), whose members include most of the world's largest pharmaceutical and biotechnology companies.

The goal of the FDA's CIPA initiative is to develop a new paradigm for cardiac safety evaluation of new drugs that provides a more comprehensive assessment of proarrhythmic potential by (i) evaluating effects of multiple cardiac ionic currents beyond hERG and ICH S7B Guidelines (inward and outward currents), (ii) providing more complete, accurate assessment of proarrhythmic effects on human cardiac electrophysiology, and (iii) focusing on Torsades de Pointes proarrhythmia rathe