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

FORM 10-Q

(Mark One)

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the quarterly period ended September 30, 2017

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to

Commission File Number: 001-38052

TOCAGEN INC.

(Exact name of registrant as specified in its charter)

Delaware	**26 - 1243872**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification Number)**
3030 Bunker Hill Street, Suite 230, San Diego, CA	**92109**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code: (858) 412-8400

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. ☒ Yes ☐ No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). ☒ Yes ☐ No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and ''emerging growth 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 filer	☐
Emerging growth company	☒		

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☒

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

As of November 6, 2017, the registrant had 19,809,449 shares of common stock, par value $0.001 per share, outstanding.

TOCAGEN INC.
TABLE OF CONTENTS

PART I - FINANCIAL INFORMATION

Item 1. Financial Statements.

TOCAGEN INC.
CONDENSED BALANCE SHEETS
(in thousands, except share and par value data)

	September 30, 2017 (unaudited)	December 31, 2016
ASSETS		
Current assets:		
Cash and cash equivalents	$ 74,842	$ 5,510
Marketable securities	24,731	25,735
Prepaid expenses and other current assets	1,238	1,216
Total current assets	100,811	32,461
Property and equipment, net	1,045	743
Other assets	314	2,147
Total assets	$ 102,170	$ 35,351
LIABILITIES, CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY (DEFICIT)		
Current liabilities:		
Accounts payable	$ 1,154	$ 1,666
Accrued liabilities	8,320	5,437
Notes payable, current portion	7,200	7,200
Deferred license revenue	41	45
Deferred grant funding	23	34
Total current liabilities	16,738	14,382
Notes payable, net of current portion	5,276	10,241
Convertible promissory notes payable (due to related parties of $0 and $1,025 at September 30, 2017 and December 31, 2016, respectively)	—	3,398
Convertible promissory notes subscription liability	—	140
Long-term portion of deferred license revenue	41	68
Preferred stock warrant liabilities	—	126
Total liabilities	22,055	28,355
Commitments and contingencies		
Convertible preferred stock, $0.001 par value; 51,000,000 shares authorized at December 31, 2016; 46,163,605 shares issued and outstanding at December 31, 2016; aggregate liquidation preferences of $131,720 at December 31, 2016	—	131,413
Stockholders' equity (deficit):		
Preferred stock, $0.001 par value; 10,000,000 shares authorized at September 30, 2017; no shares issued or outstanding at September 30, 2017	—	—
Common stock, $0.001 par value; 200,000,000 and 77,800,000 shares authorized at September 30, 2017 and December 31, 2016, respectively; 19,809,449 and 2,202,517 shares issued and outstanding at September 30, 2017 and December 31, 2016, respectively	20	2
Additional paid-in capital	236,190	3,581
Accumulated deficit	(156,092)	(128,000)
Accumulated other comprehensive loss	(3)	—
Total stockholders' equity (deficit)	80,115	(124,417)
Total liabilities, convertible preferred stock and stockholders' equity (deficit)	$ 102,170	$ 35,351

See accompanying notes.

TOCAGEN INC.
CONDENSED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(in thousands, except share and per share data)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2017	2016	2017	2016
	(unaudited)		(unaudited)	
License revenue	$ 10	$ 11	$ 31	$ 38
Operating expenses:				
Research and development	7,563	7,586	20,819	20,585
General and administrative	2,184	956	6,154	3,170
Total operating expenses	9,747	8,542	26,973	23,755
Loss from operations	(9,737)	(8,531)	(26,942)	(23,717)
Other income (expense), net:				
Interest income	214	53	354	170
Interest expense	(430)	(511)	(1,541)	(1,519)
Change in fair value of preferred stock warrants	—	(11)	37	18
Total other income (expense), net	(216)	(469)	(1,150)	(1,331)
Net loss	(9,953)	(9,000)	(28,092)	(25,048)
Other comprehensive income (loss):				
Net unrealized gain (loss) on investments	4	—	(3)	67
Comprehensive loss	$ (9,949)	$ (9,000)	$ (28,095)	$ (24,981)
Net loss per common share, basic and diluted	$ (0.50)	$ (4.09)	$ (2.19)	$ (11.39)
Weighted-average number of common shares outstanding, basic and diluted	19,809,449	2,200,509	12,847,206	2,199,114

See accompanying notes.

TOCAGEN INC.
CONDENSED STATEMENTS OF CASH FLOWS
(in thousands)

	Nine Months Ended September 30,	
	2017	2016
	(unaudited)	
OPERATING ACTIVITIES		
Net loss	$ (28,092)	$ (25,048)
Adjustments to reconcile net loss to net cash used in operating activities:		
Stock-based compensation	3,076	920
Depreciation	196	190
Noncash interest expense	441	423
Change in fair value of preferred stock warrants	(37)	(18)
Amortization of premium (discount) on investments, net	(6)	5
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(100)	(376)
Accounts payable	(500)	864
Accrued liabilities	3,103	1,333
Deferred license revenue	(31)	(38)
Deferred grant funding	(11)	(46)
Net cash used in operating activities	(21,961)	(21,791)
INVESTING ACTIVITIES		
Proceeds from the sale/maturity of marketable securities	32,651	36,663
Purchases of marketable securities	(31,644)	(18,419)
Purchases of property and equipment	(337)	(515)
Proceeds from sale of property and equipment	20	—
Net cash provided by investing activities	690	17,729
FINANCING ACTIVITIES		
Proceeds from offering of common stock, net of issuance costs	88,618	—
Proceeds from issuance of convertible promissory notes, net of issuance costs	7,338	586
Principal payments on notes payable	(5,400)	—
Proceeds from issuance of common stock	47	10
Cash paid for deferred debt and equity issuance costs	—	(596)
Net cash provided by financing activities	90,603	—
Net increase (decrease) in cash and cash equivalents	69,332	(4,062)
Cash and cash equivalents, beginning of period	5,510	8,150
Cash and cash equivalents, end of period	$ 74,842	$ 4,088
NONCASH ACTIVITIES		
Convertible preferred stock converted into shares of common stock	$ 131,410	$ —
Convertible promissory notes principal and accrued interest converted into shares of common stock	$ 11,092	$ —
Preferred stock warrant liabilities converted into warrants to purchase shares of common stock	$ 89	$ —
Deferred equity issuance costs paid in previous periods reclassified to equity on effective date of initial public offering	$ 1,574	$ —
Deferred debt and equity issuance costs in accounts payable and accrued liabilities	$ 96	$ 247
Property and equipment purchases included in accounts payable and accrued liabilities	$ 161	$ 27

See accompanying notes.

TOCAGEN INC.
NOTES TO UNAUDITED CONDENSED FINANCIAL STATEMENTS

1. Organization and Basis of Presentation

Tocagen Inc. (Tocagen or the Company) is a clinical-stage, cancer-selective gene therapy company focused on developing first-in-class, broadly-applicable product candidates designed to activate a patient's immune system against their own cancer from within. The Company's cancer-selective gene therapy platform is built on retroviral replicating vectors which are designed to selectively deliver therapeutic genes into the DNA of cancer cells. Tocagen's gene therapy approach is designed to fight cancer through immunotherapeutic mechanisms of action without the autoimmune toxicities commonly experienced with other immunotherapies.

From inception through September 30, 2017, the Company has devoted substantially all of its efforts to developing its gene therapy platform and its lead product candidate, Toca 511 & Toca FC, as well as raising capital and building its infrastructure. The Company has not generated revenues from its principal operations.

Initial Public Offering

On April 19, 2017, the Company completed its initial public offering (IPO), whereby the Company sold an aggregate of 9,775,000 shares of its common stock, at $10.00 per share, resulting in net proceeds of $86.9 million after underwriting discounts, commissions and offering costs of $10.8 million, of which $9.1 million of the costs were paid during the nine months ended September 30, 2017.

In addition, in connection with the IPO, all of the Company's outstanding shares of convertible preferred stock were converted into an aggregate of 6,690,066 shares of the Company's common stock, warrants to purchase up to 68,572 shares of the Company's Series H convertible preferred stock were converted into warrants to purchase up to 9,936 shares of the Company's common stock, each at an exercise price of $36.23 per share, and $11.1 million of aggregate principal and accrued interest underlying convertible promissory notes were automatically converted into an aggregate of 1,109,176 shares of the Company's common stock at the IPO price of $10.00 per share.

Liquidity

The Company has a limited operating history and the sales and income potential of the Company's business and patient markets are unproven. The Company has experienced net losses and negative cash flows from operating activities since its inception. As of September 30, 2017, the Company had an accumulated deficit of $156.1 million and working capital of $84.1 million available to fund future operations. As the Company continues to incur net losses, its transition to profitability is dependent upon the successful development, approval, and commercialization of its product candidates and achieving a level of revenues adequate to support the Company's cost structure. The Company may never achieve profitability, and unless and until it does, the Company will continue to need to raise additional capital.

In performing the first step of the assessment under Accounting Standards Codification Topic 205-40, Presentation of Financial Statements - Going Concern, the Company concluded that, based on its cash resources available as of September 30, 2017, which include the $86.9 million in net proceeds obtained from its IPO, it will have sufficient resources to fund its business for at least the next 12 months from the date of this filing.

Use of Estimates

The Company's financial statements are prepared in accordance with accounting principles generally accepted in the United States (GAAP), which requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and expenses and related disclosures during the reporting period. Significant estimates in the Company's financial statements relate to clinical trial accruals, the valuation of equity awards, and the development period used for license revenue recognition. Estimates are periodically reviewed in light of changes in circumstances, facts and experience. Actual results may differ from these estimates under different assumptions or conditions.

Interim Financial Reporting

The accompanying unaudited condensed financial statements have been prepared pursuant to the rules and regulations of the Securities and Exchange Commission (SEC). Certain information and note disclosures normally included in annual audited financial statements prepared in accordance with GAAP have been omitted. The accompanying unaudited condensed financial statements include all known adjustments necessary for a fair presentation of the results of interim periods as required by GAAP. These

adjustments consist primarily of normal recurring accruals and estimates that impact the carrying value of assets and liabilities. Actual results may materially differ from these estimates. Operating results for the three and nine months ended September 30, 2017 are not necessarily indicative of the results that may be expected for the year ending December 31, 2017. The accompanying unaudited condensed financial statements should be read in conjunction with the Company's audited financial statements for the year ended December 31, 2016, which are included in the Company's Registration Statement on Form S-1, as amended, originally filed with the SEC on March 9, 2017.

Segment Reporting

Operating segments are identified as components of an enterprise about which separate discrete financial information is available for evaluation by the chief operating decision maker, or decision making group, in making decisions on how to allocate resources and assess performance. The Company views its operations and manages its business in one operating segment. No product revenue has been generated since inception and all assets are held in the United States.

2. Summary of Significant Accounting Policies

Cash, Cash Equivalents and Marketable Securities

Cash consists of the balance in a readily available checking account. Cash equivalents consist of money market funds, certificates of deposit and U.S. Treasury securities with remaining maturities of three months or less at the time of purchase, and are considered highly liquid investments.

Marketable securities consist of certificates of deposit and U.S. Treasury securities that have original maturities greater than three months at the time of purchase. The Company classifies its investments as available-for-sale and records such assets at fair value in the balance sheet, with unrealized gains and losses, if any, reported in stockholders' equity (deficit). Realized gains and losses are calculated on the specific identification method and recorded to interest income.

A decline in the market value of any marketable security below cost that is determined to be other-than-temporary results in a revaluation of its carrying amount to fair value and a new cost basis for the security. Impairment losses are recognized in other expense in the statement of operations.

Concentration of Credit Risk and Off-Balance Sheet Risk

Financial instruments that potentially subject the Company to significant concentration of credit risk consist primarily of cash equivalents and marketable securities. The Company's investment policy includes guidelines for the quality of the related institutions and financial instruments, and defines allowable investments that the Company may invest in, which the Company believes minimizes the exposure to concentration of credit risk.

Deferred Equity Issuance Costs

Specific incremental costs directly attributable to a proposed or actual offering of securities are deferred and charged against the gross proceeds of the offering through additional paid-in capital.

Fair Value of Financial Instruments

The Company's financial instruments consist principally of cash, cash equivalents, marketable securities, accounts payable, notes payable, convertible promissory notes payable and preferred stock warrant liabilities.

The authoritative accounting guidance defines fair value, establishes a consistent framework for measuring fair value and expands disclosure for each major asset and liability category measured at fair value on either a recurring or nonrecurring basis. Fair value is defined as an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. As a basis for considering such assumptions, the authoritative accounting guidance establishes a three-tier fair value hierarchy that prioritizes the inputs used in measuring fair value as follows:

Level 1: Observable inputs such as quoted prices in active markets;

Level 2: Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active, or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities; and

Level 3: Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

Clinical Trial Accruals

Expenses related to clinical studies are based on estimates of the services received and efforts expended pursuant to the Company's contract arrangements. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to the Company's service providers will temporarily exceed the level of services provided and result in a prepayment of the clinical expense. Payments under some of these contracts depend on factors such as the successful enrollment of patients, site initiation and the completion of clinical milestones. The Company makes estimates of its accrued expenses as of each balance sheet date in its financial statements based on facts and circumstances known at that time. In accruing service fees, the Company estimates the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from its estimate, the Company adjusts the accrual or prepaid expense balance accordingly.

Revenue Recognition

Revenue is comprised of license revenue from the up-front payment that the Company received under its license and collaboration arrangement with Siemens Healthcare Diagnostics Inc. (Siemens).

Revenue is recognized for each unit of accounting when all of the following criteria are met:

- Persuasive evidence of an arrangement exists
- Delivery of the Company's obligations under the arrangement has occurred
- The seller's price to the buyer is fixed or determinable
- Collectability is reasonably assured

Amounts received prior to satisfying the revenue recognition criteria are recorded as deferred revenue in the Company's balance sheets. Amounts expected to be recognized as revenue within the 12 months following the balance sheet date are classified as deferred revenue. Amounts not expected to be recognized as revenue within the 12 months following the balance sheet date are classified as long-term deferred revenue.

The Company analyzes multiple-element arrangements based on the relevant authoritative guidance. Pursuant to the guidance, the Company evaluates multiple-element arrangements to determine (1) the deliverables included in the arrangement and (2) whether the individual deliverables represent separate units of accounting, or whether they must be accounted for as a combined unit of accounting. This evaluation involves subjective determinations and requires the Company to make judgments about the individual deliverables and whether such deliverables are separable from the other aspects of the contractual relationship. Deliverables are considered separate units of accounting provided that: (i) the delivered item(s) has value to the customer (a collaboration partner to date) on a standalone basis and (ii) if the arrangement includes a general right of return relative to the delivered item(s), delivery or performance of the undelivered item(s) is considered probable and substantially in its control. In assessing whether an item has standalone value, the Company considers factors such as the research, manufacturing and commercialization capabilities of the collaboration partner and the availability of the associated expertise in the general marketplace. In addition, the Company considers whether the collaboration partner can use the other deliverable(s) for their intended purpose without the receipt of the remaining element(s), whether the value of the deliverable is dependent on the undelivered item(s) and whether there are other vendors that can provide the undelivered element(s).

Arrangement consideration that is fixed or determinable is allocated among the separate units of accounting using the relative selling price method. The Company determines the estimated selling price for units of accounting within each arrangement using vendor-specific objective evidence (VSOE) of selling price, if available, third-party evidence (TPE) of selling price if VSOE is not available, or best estimate of selling price (BESP) if neither VSOE nor TPE is available. The Company uses BESP to estimate the selling price, since it generally does not have VSOE or TPE of selling price for its units of accounting. Determining the BESP for a unit of accounting requires significant judgment. In developing the BESP for a unit of accounting, the Company considers applicable market conditions and relevant entity-specific factors, including factors that were contemplated in negotiating the agreement with the collaboration partner and estimated costs. The Company validates the BESP for units of accounting by evaluating whether changes in the key assumptions used to determine the BESP will have a significant effect on the allocation of arrangement consideration between multiple units of accounting.

The Company then applies the applicable revenue recognition criteria to each of the separate units of accounting in determining the appropriate period and pattern of recognition. If there is no discernible pattern of performance and/or objectively measurable performance measures do not exist, then the Company recognizes revenue under the arrangement on a straight-line basis over the period it expects to complete its performance obligations.

Research and Development Costs

Research and development expenses consist primarily of salaries and related expenses for personnel including stock-based compensation costs, preclinical costs, clinical trial costs, costs related to acquiring and manufacturing clinical trial materials, contract services, facilities costs, overhead costs, and depreciation. All research and development costs are expensed as incurred.

Debt Issuance Costs

Debt issuance costs incurred to obtain debt financing are deferred and are amortized over the term of the debt using the effective interest method. The costs are recorded as a reduction to the carrying value of the debt and the amortization expense is included in interest expense in the statement of operations.

Warrants for Shares of Preferred Stock

The Company accounts for warrants for shares of preferred stock with conversion features as liabilities in the accompanying balance sheets at their fair value on the date of issuance. The warrant liabilities are revalued at each balance sheet date until such instruments are exercised or expire, with changes in the fair value between reporting periods recorded as other income or expense in the statement of operations. All preferred stock warrant liabilities were reclassified to equity in connection with the IPO.

Comprehensive Income (Loss)

All components of comprehensive income (loss) are reported in the financial statements in the period in which they are recognized. Other comprehensive income (loss) is defined as the change in equity during a period from transactions and other events and circumstances from non-owner sources, including unrealized gains and losses on investments. The Company's only component of other comprehensive loss is unrealized gains (losses) on investments. Comprehensive gains (losses) have been reflected in the statements of operations and comprehensive loss for all periods presented.

Stock-Based Compensation

Stock-based compensation expense represents the cost of the grant date fair value of stock awards, including stock options, and stock purchase rights granted to employees. For awards with time-based vesting provisions, the Company estimates the fair value of stock options on the date of grant using the Black-Scholes option pricing model and recognizes the expense over the requisite service period of the awards, which is generally the vesting period, on a straight-line basis. For awards with performance-based vesting provisions, the Company estimates the fair value of stock option grants on the date of grant, or the date when all of the terms of the grant have been agreed to, if later, and recognizes the expense based on the probability of the occurrence of the individual milestones at each reporting period. The expense is recognized over the implicit service period that commences once management believes the performance criteria are probable of being met. For purchase rights, the Company estimates the fair value of the purchase as of the plan enrollment date and recognizes expense on a straight-line basis over the applicable offering period. The Company accounts for forfeitures when they occur, and reverses any compensation cost previously recognized for awards for which the requisite service has not been completed, in the period that the award is forfeited.

The Company accounts for stock options and stock warrants granted to non-employees using the fair value approach. These option and warrant grants are subject to periodic revaluation over their vesting terms.

Net Loss Per Share

Basic and diluted net loss per common share for the periods presented is computed by dividing net loss by the weighted-average number of common shares outstanding during the respective periods, without consideration of common stock equivalents as they are anti-dilutive. Common stock equivalents that could potentially dilute earnings in the future are comprised of shares issuable upon the conversion of all outstanding principal and accrued interest related to convertible promissory notes payable, shares issuable upon the conversion of convertible preferred stock, options to purchase shares of common stock outstanding under the Company's equity incentive plan and warrants for the purchase of shares of common and preferred stock. For all periods presented, there is no difference in the number of shares used to calculate basic and diluted shares outstanding due to the Company's net loss position.

Common stock equivalents from potentially dilutive securities, excluding shares issuable upon the conversion of all outstanding principal and accrued interest related to convertible promissory notes, that are not included in the calculation of diluted net loss per share, because to do so would be anti-dilutive, are as follows:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2017	2016	2017	2016
Common stock options	2,636,060	906,599	2,636,060	906,599
Common stock warrants	10,660	724	10,660	724
Convertible preferred stock (as-converted)	—	6,690,066	—	6,690,066
Convertible preferred stock warrants (as-converted)	—	9,936	—	9,936
Total	2,646,720	7,607,325	2,646,720	7,607,325

Recent Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board (FASB) issued new revenue recognition guidance which outlines a single comprehensive revenue model for entities to use in accounting for revenue arising from contracts with customers. The guidance supersedes most current revenue recognition guidance, including industry-specific guidance. The guidance provides that an entity recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The guidance will be effective on January 1, 2018 and earlier application is permitted only for annual reporting periods beginning after December 15, 2016, including interim reporting periods within that reporting period. The guidance allows for either a full retrospective adoption, in which the standard is applied to all of the periods presented, or a modified retrospective adoption, in which the standard is applied to the most current period presented in the financial statements. As of September 30, 2017, revenue has been generated exclusively from the Company's license and collaboration arrangement with Siemens. The Company is currently evaluating the potential impact that this guidance may have on its financial position and results of operations as it relates to this single arrangement, and expects to elect the modified retrospective adoption method. No material changes are expected upon adoption.

In January 2016, the FASB issued new guidance that amends certain aspects of the recognition, measurement, presentation and disclosure of financial instruments. The amendments include the elimination of the available-for-sale classification of equity investments and requires equity investments with readily determinable fair values to be measured at fair value with changes in fair value recognized in net income (loss). The new guidance is effective for fiscal years and interim periods within those years beginning after December 15, 2017, and requires a cumulative-effect adjustment to the balance sheet as of the beginning of the fiscal year of adoption. Early adoption is not permitted. The Company's marketable securities are currently accounted for as available-for-sale financial instruments with changes in fair value recognized in other comprehensive income (loss). At the time of adoption, any amounts in accumulated other comprehensive income (loss) related to such financial instruments would be reclassified to non-operating income (expense) in the statement of operations. As of September 30, 2017, a net unrealized loss of $3,000 related to these investments was recorded in accumulated other comprehensive loss in the accompanying balance sheet.

In February 2016, the FASB issued new accounting guidance that amends the existing accounting standards for leases. Under the new guidance, lessees will be required to recognize for all leases, with the exception of short-term leases, a lease liability, which is a lessee's obligation to make lease payments arising from a lease, measured on a discounted basis and a right-of-use asset, which is an asset that represents the lessee's right to use, or control the use of, a specified asset for the lease term. The new standard is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. Early adoption is permitted. The Company is still in the process of evaluating the effect of adoption on its financial statements and expects to adopt the standard on January 1, 2019. The adoption will lead to an increase in the assets and liabilities recorded on the condensed balance sheets primarily due to the lease agreement attributable to leased lab and office space.

3. Fair Value of Financial Instruments

Fair Values of Assets and Liabilities Measured on a Recurring Basis

The following tables summarize the Company's assets and liabilities that require fair value measurements on a recurring basis and their respective input levels based on the fair value hierarchy (in thousands):

		Fair Value Measurements at End of Period Using:		
	Total	Quoted Market Prices for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
September 30, 2017				
Cash equivalents:				
U.S. Treasury securities	$ 59,304	$ 59,304	$ —	$ —
Marketable securities:				
Certificates of deposit	$ 20,931	$ —	$ 20,931	$ —
U.S. Treasury securities	3,800	3,800	—	—
	$ 24,731	$ 3,800	$ 20,931	$ —

		Fair Value Measurements at End of Period Using:		
	Total	Quoted Market Prices for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
December 31, 2016				
Cash equivalents:				
Certificates of deposit	$ 240	$ —	$ 240	$ —
Marketable securities:				
Certificates of deposit	$ 22,777	$ —	$ 22,777	$ —
U.S. Treasury securities	2,958	2,958	—	—
	$ 25,735	$ 2,958	$ 22,777	$ —
Preferred stock warrant liabilities	$ 126	$ —	$ —	$ 126

Marketable Securities. For fair values determined by Level 1 inputs, which utilize quoted prices in active markets for identical assets, the level of judgment required to estimate fair value is relatively low. The fair values of investments in U.S. treasury securities were determined using Level 1 inputs.

Fair values determined by Level 2 inputs, which utilize data points that are observable such as quoted prices, interest rates and yield curves, require the exercise of judgment and use of estimates, that if changed, could significantly affect the Company's financial position and results of operations. Investments in certificates of deposit are valued using Level 2 inputs. Level 2 securities are initially valued at the transaction price and subsequently valued and reported utilizing inputs other than quoted prices that are observable either directly or indirectly, such as quotes from third-party pricing vendors.

There were no transfers in or out of Level 1 or Level 2 investments during the nine months ended September 30, 2017 or 2016.

At September 30, 2017 and December 31, 2016, the Company had investments in money market funds of $13.2 million and $2.2 million, respectively, that were measured at fair value using the net asset value per share (or its equivalent) that have not been classified in the fair value hierarchy. The funds invest primarily in U.S. government securities.

Warrant Liabilities. The Company's preferred stock warrants were accounted for as liabilities and measured at fair value on a recurring basis as they were convertible into preferred stock, contingently redeemable under conditions that are not in the control of the Company. The Company estimated fair values of these warrant liabilities utilizing the Black-Scholes option pricing model, which requires Level 3 inputs.

Estimating fair values of derivative financial instruments, including Level 3 instruments, requires the use of significant and subjective inputs that may, and are likely to, change over the duration of the instrument with related changes in internal and external market factors, including changes in the estimated fair value of the Company's equity securities.

The following table summarizes the activity in liabilities measured at fair value on a recurring basis using significant unobservable inputs (Level 3 inputs) (in thousands):

	Preferred Stock Warrant Liabilities
Balance at December 31, 2016	$ 126
Gain on warrant valuation included in other income (expense), net	(37)
Conversion of preferred stock warrants to warrants to purchase shares of common stock	(89)
Balance at September 30, 2017	$ —

Fair Values of Other Financial Instruments

The carrying amounts of certain of the Company's financial instruments, including cash and accounts payable, approximate their respective fair values due to their short-term nature. The carrying amount of the Company's notes payable of $12.5 million at September 30, 2017 approximated their fair value as the terms of the notes are consistent with the market terms of transactions with similar profiles of one of the lenders as of those dates (Level 3 inputs).

4. Certain Financial Statement Caption Information

Marketable Securities

The following is a summary of the Company's marketable securities (in thousands):

	Maturity (in years)	Amortized Cost	Unrealized Gain	Unrealized Loss	Fair Value
September 30, 2017:					
Certificates of deposit	1 or less	$ 20,934	—	$ (3)	$ 20,931
U.S. Treasury securities	1 or less	3,800	—	—	3,800
		$ 24,734	$ —	$ (3)	$ 24,731
December 31, 2016:					
Certificates of deposit	1 or less	$ 19,299	$ 1	$ (2)	$ 19,298
Certificates of deposit	>1 and <5	3,478	1	—	3,479
U.S. Treasury securities	1 or less	1,678	—	—	1,678
U.S. Treasury securities	>1 and <5	1,280	4	(4)	1,280
		$ 25,735	$ 6	$ (6)	$ 25,735

The Company has classified all of its available-for-sale investment securities, including those with maturity greater than one year, as current assets on the balance sheet based on the highly liquid nature of these investment securities and because these investment securities are considered available for use in current operations.

There were no impairments considered other-than-temporary during the periods presented, as it is management's intention and ability to hold the securities until a recovery of the cost basis or recovery of fair value. Gross realized gains and losses on sales of marketable securities were immaterial for all periods presented.

Accrued Liabilities

Accrued liabilities are comprised of (in thousands):

	September 30, 2017	December 31, 2016
Clinical trial expenses	$ 2,826	$ 2,196
Contract manufacturing services	1,779	1,508
Payroll and other employee-related expenses	2,340	728
Professional fees	391	459
Contract research services	53	114
Interest payable	87	120
Other	844	312
Total accrued liabilities	$ 8,320	$ 5,437

5. Notes Payable

Loan Agreement

On October 30, 2015, the Company entered into a Loan and Security Agreement (the Loan Agreement) with two lenders whereby it borrowed $18.0 million (the Loans) on October 30, 2015. Balances under the Loan Agreement bear a floating rate of interest equal to the greater of 7.75% or the monthly prime rate plus 4.50% (8.75% and 8.00% at September 30, 2017 and December 31, 2016, respectively), and are due in monthly principal and interest payments, with final maturity of the Loans in May 2019. Each Loan bears a final payment fee of 7.95% of the original principal amount due upon maturity.

The costs incurred to issue the Loans of $0.6 million were deferred and are included in the discount to the carrying value of the Loans in the accompanying balance sheets. The Loans also include a final payment fee of $1.4 million due at the earlier of prepayment or the maturity date of the Loans. The deferred costs and the final payment fee are amortized to interest expense over the expected term of the Loans using the effective interest method. The effective interest rates on the Loans at September 30, 2017 and December 31, 2016 are 11.94% and 11.19%, respectively.

The aggregate carrying amounts of the Loans are comprised of the following (in thousands):

	September 30, 2017	December 31, 2016
Principal	$ 12,000	$ 17,400
Add: accreted liability for final payment fee	765	462
Less: unamortized discount	(289)	(421)
	$ 12,476	$ 17,441

The Loans are secured by substantially all of the Company's assets other than its intellectual property, except rights to payment from the sale, licensing or disposition of such intellectual property. The Company is also required to maintain its primary operating accounts at all times with one of the lenders. The Loan Agreement contains customary conditions of borrowing, events of default and covenants, including covenants that restrict the Company's ability to dispose of assets, merge with or acquire other entities, incur indebtedness and make distributions to holders of its capital stock. Should an event of default occur, including the occurrence of a material adverse change, the Company could be liable for immediate repayment of all obligations under the Loan Agreement. At September 30, 2017, the Company was in compliance with the covenants contained in the Loan Agreement.

Future maturities of the Loans, including the final payment fee, as of September 30, 2017 are as follows (in thousands):

	September 30, 2017
Remainder of 2017	$ 1,800
Year ending December 31, 2018	7,200
Year ending December 31, 2019	4,431
	13,431
Unaccreted balance for final payment fee on Loans	(666)
Unamortized discounts	(289)
	12,476
Less current portion	(7,200)
Noncurrent portion	$ 5,276

Convertible Promissory Notes Payable and Subscription Liability

During the three months ended March 31, 2017 and December 31, 2016, the Company issued convertible promissory notes to investors in aggregate principal amount of $7.5 million and $3.4 million, respectively, for a total aggregate principal amount of $10.9 million (the Convertible Notes). Of the Convertible Notes issued during the three months ended March 31, 2017, $140,000 was subscribed for at December 31, 2016, $250,000 was issued to a member of the Company's board of directors and $10,000 was issued to the Company's chief executive officer. The Convertible Notes, which bore interest at 7% per annum, were unsecured and were subordinated to the Loans.

At December 31, 2016, the aggregate carrying amount of the Convertible Notes was $3.4 million, which is net of an unamortized discount of $34,000. At December 31, 2016, the Convertible Notes included $1.0 million issued to members of the Company's board of directors and $25,000 issued to the Company's chief executive officer. The effective interest rate on the Convertible Notes at December 31, 2016 was 7.54%.

Upon completion of the Company's IPO, $11.1 million of aggregate principal and accrued interest underlying the Convertible Notes were automatically converted into an aggregate of 1,109,176 shares of the Company's common stock at the IPO price of $10.00 per share.

6. Stockholders' Equity (Deficit)

In March 2017, the Company's board of directors and stockholders approved a 1-for-6.9 reverse stock split of the Company's outstanding common stock. The accompanying financial statements and notes to the financial statements give retroactive effect to the reverse stock split for all periods presented.

Upon completion of the Company's IPO, all of the Company's outstanding shares of convertible preferred stock were converted into an aggregate of 6,690,066 shares of the Company's common stock. As of September 30, 2017, the Company's authorized capital stock consists of 200,000,000 shares of common stock, par value $0.001 per share, and 10,000,000 shares of preferred stock, par value $0.001 per share.

The Company had 19,809,449 and 2,202,517 shares of common stock outstanding as of September 30, 2017 and December 31, 2016, respectively.

Changes in the number of shares of the Company's convertible preferred and common stock outstanding and total stockholders' equity (deficit) during the nine months ended September 30, 2017 were as follows (in thousands, except share amounts):

	Shares of Convertible Preferred Stock	Shares of Common Stock	Total Stockholders' Equity (Deficit)
Balance, December 31, 2016	46,163,605	2,202,517	$ (124,417)
Stock-based compensation	—	—	3,076
Exercise of stock options	—	32,688	47
Fractional shares adjustment upon reverse stock split	—	2	—
Preferred stock converted into shares of common stock	(46,163,605)	6,690,066	131,410
Initial public offering of common shares, net of issuance costs	—	9,775,000	86,948
Convertible promissory notes converted into shares of common stock, net of costs to issue	—	1,109,176	11,057
Preferred stock warrants converted into common stock warrants	—	—	89
Other comprehensive loss	—	—	(3)
Net loss	—	—	(28,092)
Balance, September 30, 2017	—	19,809,449	$ 80,115

Common Stock Reserved for Future Issuance

Common stock reserved for future issuance at September 30, 2017 is as follows:

Issued and Outstanding:	
Stock options	2,636,060
Warrants for common stock	10,660
Shares reserved for issuance under the ESPP	250,000
Shares reserved for future award grants	489,602
Total	3,386,322

7. Equity Incentive Plans and Stock-Based Compensation

2017 Equity Incentive Plan

In March 2017, the Company's board of directors and stockholders approved and adopted the Company's 2017 Equity Incentive Plan (the 2017 Plan), which became effective on April 12, 2017. The 2017 Plan provides for the grant of incentive stock options (ISOs), nonstatutory stock options, stock appreciation rights, restricted stock awards, restricted stock unit awards, performance based stock awards, other forms of equity compensation and performance cash awards. ISOs may be granted only to employees. All other awards may be granted to employees, including officers, and to non-employee directors and consultants of the Company and its affiliates.

Initially, 1,600,000 new shares of common stock were approved for issuance under the 2017 Plan and, on April 12, 2017, 75,517 shares of common stock reserved for issuance under the Company's 2009 Equity Incentive Plan, as amended (the 2009 Plan), were added to the shares initially reserved under the 2017 Plan. No further grants will be made under the 2009 Plan and any shares subject to outstanding stock options under the 2009 Plan that would otherwise be returned to the 2009 Plan will instead be added to the shares reserved under the 2017 Plan. Additionally, the number of shares of common stock reserved for issuance under the 2017 Plan will automatically increase on January 1 of each calendar year, from January 1, 2018 through January 1, 2027, by 4% of the total number of shares of the Company's capital stock outstanding on December 31 of the preceding calendar year, or a lesser number of shares determined by the Company's board of directors.

As of September 30, 2017, awards for up to 3,125,662 shares of common stock are reserved under the 2009 Plan and the 2017 Plan, of which 2,636,060 shares are reserved for issuance upon exercise of granted and outstanding stock options and 489,602 shares are available for future grants.

All grants of common stock options under the 2017 Plan expire in 10 years. Grants with time-based vesting provisions are subject to a four-year vesting schedule with 25% vesting after the first year, and the balance vesting monthly over the remaining 36 months. Grants with performance-based vesting provisions vest upon the achievement of three separate development and regulatory milestones, with one-third of the options vesting upon the achievement of each milestone.

The following table summarizes stock option activity under the 2009 Plan and the 2017 Plan:

	Shares Subject to Options	Weighted-Average Exercise Price per Share	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Outstanding at December 31, 2016	1,385,855	$ 11.35		
Granted	1,344,245	$ 15.10		
Exercised	(32,688)	$ 1.44		
Forfeitures and cancellations	(61,352)	$ 14.47		
Outstanding at September 30, 2017	2,636,060	$ 13.31	8.4	$ 4,306
Time-based options at September 30, 2017:				
Outstanding	2,447,409	$ 13.08	8.3	$ 4,306
Vested and expected to vest	2,447,409	$ 13.08	8.3	$ 4,306
Exercisable	654,448	$ 7.21	5.4	$ 3,792
Performance-based options at September 30, 2017:				
Outstanding	188,651	$ 16.30	9.2	$ —
Vested and expected to vest	—	$ —	—	$ —
Exercisable	—	$ —	—	$ —

The total fair value of options vested during the nine months ended September 30, 2017 and 2016, was $1.2 million and $0.9 million, respectively.

The aggregate intrinsic value of options is calculated as the difference between the exercise price of the options and the fair value of the Company's common stock for those options that had exercise prices lower than the fair value of the Company's common stock. The aggregate intrinsic value of stock options exercised during the nine months ended September 30, 2017 and 2016 was $0.4 million and $62,000, respectively.

2017 Employee Stock Purchase Plan

In March 2017, the Company's board of directors and stockholders approved and adopted the Company's 2017 Employee Stock Purchase Plan (ESPP) whereby eligible employees may elect to withhold up to 15% of their earnings to purchase shares of the Company's common stock at a price per share equal to the lower of (i) 85% of the fair market value of a share of the Company's common stock on the first date of an offering or (ii) 85% of the fair market value of a share of the Company's common stock on the date of purchase (purchase right). The ESPP became effective on April 12, 2017. The ESPP authorizes the issuance of 250,000 shares of the Company's common stock pursuant to purchase rights granted to the Company's employees or to employees of any of the Company's designated affiliates. The number of shares of common stock reserved for issuance will automatically increase on January 1 of each calendar year, from January 1, 2018 through January 1, 2027, by the lesser of (a) 1% of the total number of shares of the Company's common stock outstanding on December 31 of the preceding calendar year, (b) 300,000 shares, or (c) a number determined by the Company's board of directors that is less than (a) and (b).

Stock-Based Compensation Expense

The assumptions used in the Black-Scholes option pricing model to determine the fair value of the employee stock option grants and stock purchase rights were as follows:

	Nine Months Ended September 30, 2017			Nine Months Ended September 30, 2016
	Time-Based Vesting Provisions	Performance-Based Vesting Provisions	Purchase Rights	Time-Based Vesting Provisions
Risk-free interest rate	1.83% - 2.17%	1.98% - 2.17%	1.04% - 1.24%	1.3%
Expected volatility	75.9% - 87.4%	75.2% - 76.3%	65.7% - 72.5%	73.3%
Weighted-average volatility	82.0%	75.9%	68.9%	73.3%
Dividend yield	0%	0%	0%	0%
Weighted-average expected term (in years)	6.1	6.3	1.4	6.1
Weighted-average grant date fair value per share	$ 10.50	$ 6.73	$ 4.60	$ 1.36

Risk-free interest rate. The Company bases the risk-free interest rate assumption on U.S. Treasury constant maturities with maturities similar to those of the expected term of the award being valued.

Expected volatility. Due to the Company's lack of company-specific historical or implied volatility data, the Company has based its estimate of expected volatility on the historical volatility of a group of similar companies in the life sciences industry whose shares are publicly traded. The Company selects the peer group based on comparable characteristics, including development stage, product pipeline, and enterprise value. The Company computes historical volatility data using the daily closing prices for the selected companies' shares during the equivalent period of the calculated expected term of the stock-based awards. The Company will continue to apply this process until sufficient amount of historical information regarding the volatility of its own stock price become available.

Expected term. The expected term of employee stock options granted with time-based vesting provisions was calculated using the simplified method which utilizes the midpoint between the weighted average time of vesting and the end of the contractual term. The expected term of employee stock options granted with performance-based vesting provisions was calculated using the midpoint between the estimated service period and the contractual term of the option. These methods were utilized due to a lack of historical exercise behavior by the Company's employees. The expected term for stock purchase rights is the term from the date of grant to the date of purchase.

Expected dividend yield. The Company bases the expected dividend yield assumption on the fact that it has never paid, and does not expect to pay, dividends in the foreseeable future.

The Company calculates the estimated fair value of each non-employee stock option award at the date of grant using Black-Scholes option pricing model with the assumptions generally consistent with those used for employee stock options, with the exception of expected term, which is over the contractual life.

The Company has not recognized non-cash stock-based compensation expense for outstanding options to purchase 188,651 shares of common stock with performance-based vesting provisions after its evaluation that the occurrence of the individual milestones is not probable as of September 30, 2017.

Total non-cash stock-based compensation expense for all stock awards and purchase rights, net of forfeitures recognized as they occur, that was recognized in the statements of operations is as follows (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2017	2016	2017	2016
Research and development	$ 657	$ 154	$ 1,229	$ 444
General and administrative	834	162	1,847	476
Total	$ 1,491	$ 316	$ 3,076	$ 920

Unrecognized compensation expense for stock options at September 30, 2017 was $17.9 million which is expected to be recognized over a weighted-average period of 3.2 years and unrecognized compensation expense for stock purchase rights at September 30, 2017 was $0.6 million which is expected to be recognized over a weighted-average period of 0.9 years.

8. Grant Agreement

In August 2017, the Company was awarded a $2.0 million grant by the U.S. Food and Drug Administration Office of Orphan Products Development to support its Phase 3 clinical trial (OOPD Grant). Under the grant agreement, the Company will be reimbursed for qualifying expenses over a four-year period subject to the availability of funds and satisfactory progress of the trial. At September 30, 2017, the Company had neither received nor recorded reimbursable amounts relating to the OOPD Grant.

Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our unaudited condensed financial statements and related notes included in this Quarterly Report on Form 10-Q and the audited financial statements and notes thereto as of and for the year ended December 31, 2016 and the related Management's Discussion and Analysis of Financial Condition and Results of Operations, both of which are contained in our final prospectus filed with the Securities and Exchange Commission, or SEC, on April 13, 2017 relating to our Registration Statement on Form S-1 originally filed on March 9, 2017, as amended (File No. 333-216574). Unless the context requires otherwise, references in this Quarterly Report on Form 10-Q to "we," "us," and "our" refer to Tocagen Inc.

Forward-Looking Statements

The information in this discussion contains forward-looking statements and information within the meaning of Section 27A of the Securities Act of 1933, as amended, or the Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act, which are subject to the "safe harbor" created by those sections. These forward-looking statements include, but are not limited to, statements concerning our strategy, future operations, future financial position, future revenues, projected costs, prospects and plans and objectives of management. The words "anticipates," "believes," "estimates," "expects," "intends," "may," "plans," "projects," "will," "would" and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. We may not actually achieve the plans, intentions, or expectations disclosed in our forward-looking statements and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements that we make. These forward-looking statements involve risks and uncertainties that could cause our actual results to differ materially from those in the forward-looking statements, including, without limitation, the risks set forth in Part II, Item 1A, "Risk Factors" in this Quarterly Report on Form 10-Q and in our other filings with the SEC. The forward-looking statements are applicable only as of the date on which they are made, and we do not assume any obligation to update any forward-looking statements.

Overview

We are a clinical-stage, cancer-selective gene therapy company focused on developing first-in-class, broadly-applicable product candidates designed to activate a patient's immune system against their own cancer from within. Our cancer-selective gene therapy platform is built on retroviral replicating vectors, or RRVs, which are designed to selectively deliver therapeutic genes into the DNA of cancer cells. Our gene therapy approach is designed to fight cancer through immunotherapeutic mechanisms of action without the autoimmune toxicities commonly experienced with other immunotherapies.

We are developing our lead product candidate, Toca 511 & Toca FC, initially for the treatment of recurrent high grade glioma, or HGG. In November 2015, we initiated the Phase 2 portion of a randomized, controlled Phase 2/3 clinical trial of Toca 511 & Toca FC in patients with recurrent HGG, which was designed to serve as a potential registrational trial. We completed enrollment of the Phase 2 portion with 187 patients in February 2017. In October 2017, following discussions with the FDA, we redesigned our ongoing Phase 2/3 clinical trial to be a single Phase 3 clinical trial and are including the 187 patients that were previously enrolled in the Phase 2/3 clinical trial in the total of 380 patients expected to enroll in the redesigned trial. The primary endpoint of the redesigned trial is overall survival, or OS. The primary endpoint assumes a median OS of 9.8 months for the control arm versus 14.3 months for the Toca 511 & Toca FC arm. A total of 257 events will provide the redesigned trial with 85% power to detect a hazard ratio of 0.685. The redesigned trial includes planned interim analyses at 50% and 75% of events, estimated to occur in the second half of 2018 and first half of 2019, respectively. As a result of this transition to a seamless Phase 3 clinical trial design, a previously planned data analysis of the Phase 2 portion of the original Phase 2/3 trial will no longer occur. We also have three ongoing, ascending dose Phase 1 clinical trials in recurrent HGG with varying modes of delivery of the Toca 511 vector and a Phase 1b clinical trial for the treatment of metastatic colorectal, pancreatic, breast, lung, melanoma, and renal cancers. In addition, based on our findings in preclinical studies and clinical trials to date, we believe Toca 511 & Toca FC is a promising candidate for use in combination with surgery, radiation and chemotherapy and we plan to initiate a clinical trial in the first half of 2018 for newly diagnosed HGG to assess safety in this setting. We are also developing other RRVs to selectively deliver genes to cancer cells against validated immunotherapy targets, such as the checkpoint protein PD-L1.

We do not have any products approved for sale and have not generated any revenue from product sales. We have funded our operations primarily through the private placement of our convertible preferred stock, from which we received net proceeds of $131.4 million through September 30, 2017, and our initial public offering in April 2017, from which we received net proceeds of $86.9 million. We have also received $17.7 million in net proceeds from the issuance of our notes payable, $10.9 million from the issuance of our convertible promissory notes payable, $1.6 million from private and federal grants, and a $0.5 million up-front payment from our license and collaboration agreement with Siemens Healthcare Diagnostics Inc., or Siemens.

Since our inception in August 2007, we have devoted substantially all of our efforts to developing our gene therapy platform and our lead product candidate, Toca 511 & Toca FC. We have never been profitable and have incurred significant operating losses in each year since our inception. We had an accumulated deficit of $156.1 million as of September 30, 2017. Substantially all of our net losses resulted from costs incurred in connection with our research, preclinical, clinical, product, regulatory and business development activities, as well as raising capital and building our infrastructure.

We expect to continue to incur significant expenses and increasing net operating losses for at least the next several years. We expect our expenses will increase substantially in connection with our ongoing activities as we continue to develop and seek regulatory approval of our product candidates and operate as a public company. To fund further operations, we will need to raise additional capital.

Accordingly, we will seek to fund our operations through equity and/or debt financings. We may also consider new collaborations or selectively partnering our technology or programs. However, we may be unable to raise additional funds or enter into such other arrangements when needed on favorable terms or at all. Our failure to raise capital or enter into such other arrangements as and when needed would have a negative impact on our financial condition and our ability to develop our product candidates.

On April 19, 2017, we completed our initial public offering whereby we sold an aggregate of 9,775,000 shares of our common stock, at $10.00 per share, resulting in net proceeds of $86.9 million after underwriting discounts, commissions and offering costs.

In August 2017, we were awarded a $2.0 million grant, payable over four years, by the FDA Office of Orphan Products Development to support our Phase 3 clinical trial of Toca 511 & Toca FC.

Financial Operations Overview

Revenue

We currently have no products approved for sale, and have not generated any revenues from the sale of products. We have not submitted any product candidate for regulatory approval. Our revenue has been derived from our license and collaboration arrangement we entered into with Siemens in 2011, under which we received a nonrefundable, non-creditable, lump-sum, upfront license payment of $0.5 million for our sublicense to Siemens of certain diagnostic assay technology.

In the future, we may generate revenue from a combination of product sales and royalties in connection with our Siemens agreement and any future marketing and distribution arrangements and other collaborations, strategic alliances and license arrangements, or a combination of these approaches. However, we do not expect to receive additional revenues unless and until we receive regulatory approval for product candidates or potentially enter into collaboration agreements. We do not expect any of our current product candidates to be commercially available in major markets for at least the next several years. We expect that any revenue we generate will fluctuate from quarter to quarter and year to year as a result of the timing and amount of license fees, milestone and other payments, and the amount and timing of payments that we receive upon the sale of our products, to the extent any are successfully commercialized. If we fail to complete the development of our product candidates in a timely manner or obtain regulatory approval of them, our ability to generate future revenue, and our results of operations and financial position, would be materially adversely affected.

Research and Development Expenses

Research and development expenses consist primarily of salaries and related expenses for personnel, including stock-based compensation costs, preclinical costs, clinical trial costs, costs related to acquiring and manufacturing clinical trial materials, contract services, facilities costs, overhead costs and depreciation. These activities also include research and development related to our gene therapy platform development. All research and development costs are expensed as incurred.

We cannot determine with certainty the duration and completion costs of the current or future clinical trials of our product candidates, or if, when or to what extent we will generate revenues from the commercialization and sale of any of our product candidates that obtain regulatory approval. We may never succeed in achieving regulatory approval for any of our product candidates. The duration, costs and timing of clinical trials and development of our product candidates will depend on a variety of factors, including:

- per patient trial costs;
- the number of patients that participate in the trials;
- the number of sites included in the trials;
- the countries in which the trials are conducted;

- the length of time required to enroll eligible patients;
- the drop-out or discontinuation rates of patients;
- the potential for additional safety monitoring or other clinical trials requested by regulatory agencies;
- significant and changing government regulation; and
- the timing and receipt of any regulatory approvals.

A change in the outcome of any of these variables with respect to the development of a product candidate could mean a significant change in the costs and timing associated with the development of that product candidate. For example, if the U.S. Food and Drug Administration, or FDA, or another regulatory authority were to require us to conduct clinical trials beyond those that we currently anticipate will be required for the completion of clinical development of a product candidate or if we experience significant delays in enrollment in any of our clinical trials, we could be required to expend significant additional financial resources and time on the completion of clinical development. In addition, the probability of success for each product candidate will depend on numerous factors, including competition, manufacturing capability and commercial viability. We will determine which programs to pursue and how much to fund each program in response to the scientific and clinical success of each product candidate, as well as an assessment of each product candidate's commercial potential.

The following table indicates our research and development expense by project (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2017	2016	2017	2016
Toca 511 & Toca FC	$ 7,055	$ 7,293	$ 19,781	$ 20,060
Anti-PD-L1 and IDO-1	311	122	672	274
Vector technology and other therapeutic genes	197	171	366	251
Total	$ 7,563	$ 7,586	$ 20,819	$ 20,585

We expect our research and development expenses to increase for the foreseeable future as we scale up our clinical trial and manufacturing activities and seek regulatory approval of our product candidates.

General and Administrative Expenses

General and administrative expenses consist primarily of salaries and related expenses for personnel, including stock-based compensation costs and travel expenses for our employees in executive, operational, finance and business development functions. Other general and administrative expenses include facility-related costs, consulting fees for human resources and operations, capital raising and information technology, insurance, professional fees for accounting and legal services, expenses associated with obtaining and maintaining patents and costs associated with being a public company.

We anticipate that our general and administrative expenses will increase in the future as we increase our headcount to support our expanding research and development and potential commercialization of our product candidates. We also anticipate continued increases in expenses related to audit, legal, regulatory and tax-related services associated with maintaining compliance with exchange listing and SEC requirements, director and officer insurance premiums and investor relations costs associated with being a public company. Additionally, if we believe a regulatory approval of our lead product candidate appears likely, we anticipate an increase in payroll and related expenses as a result of our preparation for commercial operations, especially as it relates to establishing a sales force and other expenses related to the sale and marketing of our product candidates.

Interest Income

Interest income consists primarily of interest income earned on cash, cash equivalents and marketable securities.

Interest Expense

Interest expense consists of stated interest and the amortization of related debt issuance costs incurred on the outstanding principal amount of our borrowings under our notes payable and convertible promissory notes payable.

Change in Fair Value of Preferred Stock Warrants

Warrants for shares of preferred stock with conversion features are accounted for as liabilities in the accompanying balance sheets at their fair value on the date of issuance. The warrant liabilities are revalued at each balance sheet date until such instruments are exercised or expire, with changes in the fair value between reporting periods recorded as change in fair value of preferred stock warrants in the statement of operations. All preferred stock warrant liabilities were reclassified to equity in connection with the IPO.

Critical Accounting Policies and Significant Judgments and Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires the use of estimates and assumptions that affect the reported amounts of assets and liabilities, revenues and expenses, and related disclosures in the financial statements. Critical accounting policies are those accounting policies that may be material due to the levels of subjectivity and judgment necessary to account for highly uncertain matters or the susceptibility of such matters to change, and that have a material impact on financial condition or operating performance. While we base our estimates and judgments on our experience and on various other factors that we believe to be reasonable under the circumstances, actual results may differ from these estimates under different assumptions or conditions.

We believe the following critical accounting policies used in the preparation of our financial statements require significant judgments and estimates:

- Accrued Research and Development Expenses
- Stock-Based Compensation

During the nine months ended September 30, 2017, there were no significant changes in our critical accounting policies and estimates.

Emerging Growth Company Status

The Jumpstart Our Business Startups Act, or JOBS Act, permits an "emerging growth company" such as us to take advantage of an extended transition period to comply with new or revised accounting standards applicable to public companies. Thus, an emerging growth company can delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this extended transition period and, as a result, we will adopt new or revised accounting standards on the relevant dates on which adoption of such standards is required for other public companies.

Recent Accounting Pronouncements

We have reviewed all recently issued standards and have determined that other than as disclosed in Note 2 to the unaudited condensed financial statements included herein, such standards will not have a material impact on our financial statements or do not otherwise apply to our operations.

Results of Operations

Comparison of the Third Quarters of 2017 and 2016

The following table summarizes our results of operations for the third quarters of 2017 and 2016 (in thousands):

	Three Months Ended September 30,		Increase
	2017	2016	(Decrease)
License revenue	$ 10	$ 11	$ (1)
Research and development expenses	7,563	7,586	(23)
General and administrative expenses	2,184	956	1,228
Interest income	214	53	161
Interest expense	(430)	(511)	81
Change in fair value of preferred stock warrants	—	(11)	11

License revenue. License revenue was $10,000 for the third quarter of 2017 as compared to $11,000 for the third quarter of 2016, a decrease of $1,000.

Research and development expenses. Research and development expenses were $7.6 million for the third quarter of 2017, as compared to $7.6 million for the third quarter of 2016. The decrease of $23,000 was primarily due to decreased costs to support our ongoing Phase 3 clinical trial as well as slightly lower manufacturing costs. We anticipate our research and development expenses will increase in future quarters.

General and administrative expenses. General and administrative expenses were $2.2 million for the third quarter of 2017, as compared to $1.0 million for the third quarter of 2016. The increase of $1.2 million, or 128%, was primarily due to continued increases in costs for supporting increased operations activity at the company as we conduct our Phase 3 clinical trial and costs associated with being a public company. Stock-based compensation expense, which represents 55% of the increase, is due primarily to stock options granted to members of our board of directors, our chief executive officer and other employees.

Interest income. Interest income was $214,000 for the third quarter of 2017, as compared to $53,000 for the third quarter of 2016. The increase of $161,000 was primarily due to our higher average cash balances earning interest at higher rates during 2017 compared to 2016.

Interest expense. Interest expense was $0.4 million for the third quarter of 2017 and represents $0.3 million in stated interest and $0.1 million in amortization of related debt issuance costs incurred on the outstanding principal amount of our borrowings under our notes payable.

Interest expense was $0.5 million for the third quarter of 2016 and represents $0.4 million in stated interest and $0.1 million in amortization of related debt issuance costs incurred on the outstanding principal amount of our borrowings under our notes payable.

Upon completion of our initial public offering, all principal and accrued interest underlying our convertible promissory notes were automatically converted into shares of our common stock and no further interest expense on these notes will be incurred after such date.

Comparison of the First Nine Months of 2017 and 2016

The following table summarizes our results of operations for the first nine months of 2017 and 2016 (in thousands):

	Nine Months Ended September 30,		Increase
	2017	2016	(Decrease)
License revenue	$ 31	$ 38	$ (7)
Research and development expenses	20,819	20,585	234
General and administrative expenses	6,154	3,170	2,984
Interest income	354	170	184
Interest expense	(1,541)	(1,519)	(22)
Change in fair value of preferred stock warrants	37	18	19

License revenue. License revenue was $31,000 for the first nine months of 2017 as compared to $38,000 for the first nine months of 2016, a decrease of $7,000.

Research and development expenses. Research and development expenses were $20.8 million for the first nine months of 2017, as compared to $20.6 million for the first nine months of 2016. The increase of $0.2 million, or 1%, was primarily due to continued increases in costs to support our ongoing Phase 3 clinical trial, partially offset by lower manufacturing costs.

General and administrative expenses. General and administrative expenses were $6.2 million for the first nine months of 2017, as compared to $3.2 million for the first nine months of 2016. The increase of $3.0 million, or 94%, was primarily due to continued increases in costs for supporting increased operations activity at the company as we conduct our Phase 3 clinical trial and costs associated with being a public company. Stock-based compensation expense, which represents 46% of the increase, is due primarily to stock options granted to members of our board of directors, our chief executive officer and other employees.

Interest income. Interest income was $0.4 million for the first nine months of 2017, as compared to $0.2 million for the first nine months of 2016. The increase of $0.2 million was primarily due to our higher average cash balances earning interest at higher rates during 2017 compared to 2016.

Interest expense. Interest expense was $1.5 million for the first nine months of 2017 and represents $0.9 million in stated interest, $0.4 million in amortization of related debt issuance costs incurred on the outstanding principal amount of our borrowings under our notes payable, and $0.2 million in interest on our convertible promissory notes payable.

Interest expense was $1.5 million for the first nine months of 2016 and represents $1.1 million in stated interest and $0.4 million in amortization of related debt issuance costs incurred on the outstanding principal amount of our borrowings under our notes payable.

Liquidity and Capital Resources

We have incurred significant losses and cumulative negative cash flows from operations since our inception. As of September 30, 2017, we had an accumulated deficit of $156.1 million and we anticipate that we will continue to incur losses for at least the next several years. We expect that our research and development and general and administrative expenses will continue to increase and, as a result, we will need additional capital to fund our operations, which we may raise through equity and/or debt financings. We may also consider new collaborations or selectively partnering our technology or programs.

Since inception through September 30, 2017, we have funded our operations primarily through the private placement of our convertible preferred stock from which we received net proceeds of $131.4 million and our initial public offering from which we received net proceeds of $86.9 million. In addition, we have also received $17.7 million in net proceeds from the issuance of our notes payable, $10.9 million from the issuance of our convertible promissory notes payable, $1.6 million from private grant funding and federal grants, and a $0.5 million up-front payment under the Siemens license and collaboration agreement.

The loans under our loan and security agreement, or the Loan Agreement, with two lenders, dated October 30, 2015, are secured by substantially all of our assets other than our intellectual property (except rights to payment from the sale, licensing of disposition of such intellectual property). We borrowed $18.0 million upon execution of the Loan Agreement. Balances under the Loan Agreement accrue interest at the prime rate plus 4.5%, subject to a floor of 7.75%. The interest rate as of September 30, 2017 was 8.75%. The loans under the Loan Agreement mature in May 2019 and are due in monthly payments of principal and interest. The Loan Agreement contains customary conditions of borrowing, events of default and covenants, including covenants that restrict our ability to dispose of assets, merge with or acquire other entities, incur indebtedness and make distributions to holders of our capital stock. Should an event of default occur, including the occurrence of a material adverse change, we could be liable for immediate repayment of all obligations under the Loan Agreement.

As of September 30, 2017, we had $99.6 million in cash, cash equivalents and marketable securities. Our available cash and marketable securities are invested in accordance with our investment policy, primarily with a view to preserve principal and maintain liquidity. Currently, our funds are held in FDIC insured cash accounts, certificates of deposits, money market funds and treasury securities that are backed by the U.S. government.

Cash Flows

The following table sets forth the primary sources and uses of cash for each of the periods set forth below (in thousands):

	Nine Months Ended September 30,	
	2017	2016
Net cash provided by (used in):		
Operating activities	$ (21,961)	$ (21,791)
Investing activities	690	17,729
Financing activities	90,603	—
Net increase (decrease) in cash and cash equivalents	$ 69,332	$ (4,062)

Operating Activities. Net cash used in operating activities was $22.0 million for the first nine months of 2017, and consisted primarily of a net loss of $28.1 million adjusted for a net increase in cash from operating assets and liabilities of $2.5 million, noncash stock-based compensation expense of $3.1 million, depreciation expense of $0.2 million and noncash interest expense of $0.4 million. The $2.5 million net increase in cash from operating assets and liabilities is due primarily to a net increase in our accounts payable and accrued liabilities resulting mainly from increased accrued payroll and related liabilities and continued increases in clinical costs incurred to support our clinical trials.

Net cash used in operating activities was $21.8 million for the first nine months of 2016, and consisted primarily of a net loss of $25.0 million adjusted for a net increase in cash from operating assets and liabilities of $1.7 million, noncash stock-based

compensation expense of $0.9 million, depreciation expense of $0.2 million and noncash interest expense of $0.4 million. The $1.7 million net increase in cash from operating assets and liabilities is due primarily to an increase in our accounts payable and accrued liabilities resulting mainly from continued increases in clinical and manufacturing costs incurred to support our clinical trials.

Investing Activities. Net cash provided by investing activities for the first nine months of 2017 was $0.7 million and consisted of proceeds from the maturity of marketable securities of $32.6 million offset primarily by purchases of marketable securities of $31.6 million and the purchase of property and equipment of $0.3 million.

Net cash provided by investing activities for the first nine months of 2016 was $17.7 million and consisted of proceeds from the maturity of marketable securities of $36.7 million, primarily offset by purchases of marketable securities of $18.4 million and the purchase of property and equipment of $0.5 million.

Financing activities. Net cash provided by financing activities for the first nine months of 2017 was $90.6 million and consisted primarily of net proceeds from our initial public offering of common stock of $88.6 million and $7.3 million from the issuance of convertible promissory notes payable and convertible promissory note subscriptions which were offset by $5.4 million in principal payments on our notes payable.

Net cash provided by financing activities for the first nine months of 2016 was $0.6 million from convertible promissory note subscriptions which was offset by $0.6 million in cash paid for deferred equity issuance costs.

Funding Requirements

Our primary uses of capital are, and we expect will continue to be, compensation and related expenses, third-party clinical research and development services, laboratory expenses, regulatory expenses, marketing, and general and administrative expenses. Based on our research and development plans and our timing expectations related to the progress of our programs, we expect that our existing cash, cash equivalents and marketable securities as of September 30, 2017 will enable us to fund our operations for at least the next 12 months. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner that we currently expect. Furthermore, our operating plan may change and we may need additional funds sooner than planned.

The successful development of any product candidate is highly uncertain. As such, at this time, we cannot reasonably estimate or know the nature, timing and costs of the efforts that will be necessary to complete the development of Toca 511 & Toca FC or our other current and future product candidates. We are also unable to predict when, if ever, material net cash inflows will commence from the sale of product candidates. This is due to the numerous risks and uncertainties associated with developing immunotherapies, including the uncertainty of:

- the progress, timing, costs and results of our ongoing Phase 3 clinical trial of Toca 511 & Toca FC;
- the progress, timing, costs and results of our ongoing Phase 1 dose escalation clinical trials that include our intratumoral study, resection study, and intravenous study;
- the progress, timing, costs and results of development for Toca 511 & Toca FC for the treatment of metastatic solid tumors;
- the progress, timing, costs and results of development for our other future product candidates;
- the outcome, timing and cost of regulatory approvals by the FDA and comparable foreign regulatory authorities, including the potential for the FDA or comparable foreign regulatory authorities to require that we perform more studies than those that we currently expect;
- the ability of our product candidates to progress through clinical development successfully;
- the cost of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights;
- arrangements with third-party service providers and manufacturers;
- our need and ability to hire additional personnel;
- our need to implement additional infrastructure and internal systems;
- the effect of competing technological and market developments; and
- the cost of establishing sales, marketing and distribution capabilities for any products for which we may receive regulatory approval.

A change in the outcome of any of these variables with respect to the development of any of our product candidates would significantly change the costs and timing associated with the development of that product candidate.

Until we can generate a sufficient amount of revenue from our products, if ever, we expect to finance future cash needs through equity and/or debt financings. We may also consider new collaborations or selectively partnering our technology or programs. We do not have any committed external source of funds. Additional capital may not be available on reasonable terms, if at all. Subject to limited exceptions, our Loan Agreement also prohibits us from incurring indebtedness without the prior written consent of the lenders. If we are unable to raise additional capital in sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue the development or commercialization of one or more of our product candidates. If we raise additional funds through the issuance of additional equity or debt securities, it could result in dilution to our existing stockholders and increased fixed payment obligations, and these securities may have rights senior to those of our common stock. If we incur indebtedness, we could become subject to covenants that would restrict our operations and potentially impair our competitiveness, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. Any of these events could significantly harm our business, financial condition and prospects.

Contractual Obligations and Commitments

Upon completion of our initial public offering, $11.1 million of aggregate principal and accrued interest underlying our outstanding convertible promissory notes were automatically converted into an aggregate of 1,109,176 shares of our common stock at the initial public offering price of $10.00 per share.

Off-Balance Sheet Arrangements

As of September 30, 2017, we did not have any off-balance sheet arrangements.

Item 3. Quantitative and Qualitative Disclosures About Market Risk.

The primary objective of our investment activities is to preserve our capital to fund our operations. We also seek to maximize income from our investments without assuming significant risk. To achieve our objectives, we maintain a portfolio of cash equivalents and investments in securities of high credit quality. As of September 30, 2017, we had cash, cash equivalents and marketable securities of $99.6 million consisting of certificates of deposit and money market funds in highly rated financial institutions in the United States, and treasury securities. A significant portion of our investments may be subject to interest rate risk and could fall in value if market interest rates increase. However, because our investments are primarily short-term in duration, we believe that our exposure to interest rate risk is not significant and a 1% movement in market interest rates would not have a significant impact on the total value of our portfolio. We actively monitor changes in interest rates.

Item 4. Controls and Procedures.

Disclosure Controls and Procedures

In evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives, and management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Our management, with the participation of our Chief Executive Officer and our Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures as of the end of the period covered by this Quarterly Report on Form 10-Q. Based on that evaluation, our Chief Executive Officer and our Chief Financial Officer concluded that our disclosure controls and procedures were effective, at the reasonable assurance level, as of the end of the period covered by this Quarterly Report on Form 10-Q to ensure that information we are required to disclose in reports that we file or submit under the Exchange Act (1) is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms, and (2) is accumulated and communicated to management, including our Chief Executive Officer and our Chief Financial Officer as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control Over Financial Reporting

There have been no changes in our internal control over financial reporting during our most recent fiscal quarter ended September 30, 2017 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

PART II – OTHER INFORMATION

Item 1. Legal Proceedings

None.

Item 1A. Risk Factors

You should carefully consider the following risk factors, as well as the other information in this report, before deciding whether to purchase, hold or sell shares of our common stock. The occurrence of any of the following risks could harm our business, financial condition, results of operations and/or growth prospects or cause our actual results to differ materially from those contained in forward-looking statements we have made in this report and those we may make from time to time. You should consider all of the factors described as well as the other information in our final prospectus filed with the SEC on April 13, 2017 relating to our Registration Statement on Form S-1 originally filed on March 9, 2017, as amended (File No. 333-216574), including our financial statements and the related notes and "Management's Discussion and Analysis of Financial Condition and Results of Operations" when evaluating our business. The risk factors set forth below that are marked with an asterisk (*) contain changes to the similarly titled risk factors included in Item 1A of our final prospectus relating to our Registration Statement on Form S-1, as amended (File No. 333-216574). If any of the following risks actually occurs, our business, financial condition, results of operations and future growth prospects would likely be materially and adversely affected. In these circumstances, the market price of our common stock would likely decline and you may lose all or part of your investments. Additional risks and uncertainties not presently known to us or that we currently deem immaterial also may impair our business operations.

Risks related to our business and industry

We have incurred significant losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future.*

We are a clinical-stage company with a limited operating history. We are not profitable and have incurred net losses in each year since our inception in 2007, including net losses of $33.5 million for the year ended December 31, 2016 and $28.1 million for the nine months ended September 30, 2017. As of September 30, 2017, we had an accumulated deficit of $156.1 million.

We have devoted substantially all of our financial resources to research and development, including our clinical, preclinical and platform development activities. To date, we have financed our operations primarily through the private placement of our convertible preferred stock, our initial public offering of our common stock, the issuance of our notes payable and the issuance of convertible promissory notes. We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future. The amount of our future net losses will depend, in part, on the rate of our future expenditures and our ability to generate revenue. We have not completed late-stage clinical trials for any product candidate and it will be several years, if ever, before we have a product candidate ready for regulatory approval and commercialization. Even if we succeed in obtaining regulatory approval and commercializing one or more of our product candidates, we will continue to incur substantial research and development and other expenditures to develop and market additional product candidates. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

We will require substantial additional financing to achieve our goals, which may not be available on acceptable terms, or at all. Failure to obtain this necessary capital when needed may force us to delay, limit or terminate our product development efforts or other operations.*

We are currently advancing our lead product candidate, Toca 511 (vocimagene amiretrorepvec) & Toca FC (flucytosine extended-release), through clinical development and other product candidates through preclinical development. Developing gene therapy products is expensive, and we expect our research and development expenses to increase substantially in connection with our ongoing activities, particularly as we advance our product candidates in clinical trials.

As of September 30, 2017, our cash, cash equivalents and marketable securities were $99.6 million. We expect that our existing cash, cash equivalents and marketable securities as of September 30, 2017 will be sufficient to fund our current operations through at least the next 12 months. However, our operating plan may change as a result of many factors currently unknown to us, and we may need to seek additional funds sooner than planned, through equity and/or debt financings. We do not have any committed external source of funds. We may also consider new collaborations or selectively partner our technology or programs. In any event, we will require additional capital to obtain regulatory approval for, and to commercialize, our product candidates. Raising funds in the current

economic environment may present additional challenges. Even if we believe we have sufficient funds for our current or future operating plans, we may seek additional capital if market conditions are favorable or if we have specific strategic considerations.

Any additional fundraising efforts may divert our management from their day-to-day activities, which may adversely affect our ability to develop and commercialize our product candidates. In addition, we cannot guarantee that future financing will be available in sufficient amounts or on terms acceptable to us, if at all. Subject to limited exceptions, our loan and security agreement also prohibits us from incurring indebtedness without the prior written consent of the lenders. Moreover, the terms of any financing may adversely affect the holdings or the rights of our stockholders and the issuance of additional securities, whether equity or debt, by us, or the possibility of such issuance, may cause the market price of our shares to decline. The sale of additional equity or convertible securities would dilute all of our stockholders. The incurrence of indebtedness would result in increased fixed payment obligations and we may be required to agree to certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. We could also be required to seek funds through arrangements with collaborative partners or otherwise at an earlier stage than otherwise would be desirable and we may be required to relinquish rights to some of our technologies or product candidates or otherwise agree to terms unfavorable to us, any of which may have a material adverse effect on our business, operating results and prospects.

If we are unable to obtain funding on a timely basis, we may be required to significantly curtail, delay or discontinue one or more of our research or development programs or the commercialization of any product candidates or be unable to expand our operations or otherwise capitalize on our business opportunities, as desired, which could materially affect our business, financial condition and results of operations.

Immunotherapy, gene therapy and biopharmaceutical product development is a highly speculative undertaking and involves a substantial degree of uncertainty. We have never generated any revenue from product sales and may never be profitable.

Since our inception in August 2007, we have devoted substantially all of our efforts to developing our gene therapy platform and our lead product candidate, Toca 511 & Toca FC. We are still in the early stages of developing our product candidates, and we have not completed development of any products. Our ability to generate revenue and achieve profitability depends in large part on our ability, alone or with partners, to successfully complete the development of, obtain the necessary regulatory approvals for, and commercialize product candidates. We do not anticipate generating revenues from sales of products for the foreseeable future. Our ability to generate future revenues from product sales depends heavily on our success in:

- completing clinical trials through all phases of clinical development of our current and future product candidates;
- seeking and obtaining marketing approvals for product candidates that successfully complete clinical trials;
- launching and commercializing product candidates for which we obtain marketing approval with a partner or, if launched independently, successfully establishing a sales force, marketing and distribution infrastructure;
- identifying and developing new product candidates;
- progressing our preclinical programs into human clinical trials;
- establishing and maintaining supply and manufacturing relationships with third parties;
- maintaining, protecting, expanding and enforcing our intellectual property; and
- attracting, hiring and retaining qualified personnel.

Because of the numerous risks and uncertainties associated with gene therapy product development, we are unable to predict the timing or amount of increased expenses or when we will be able to achieve or maintain profitability, if ever. In addition, our expenses could increase beyond expectations if we are required by the FDA or foreign regulatory agencies, to perform studies and clinical trials in addition to those that we currently anticipate or if there are any delays in the development of any of our product candidates. If one or more of the product candidates that we develop is approved for commercial sale, we anticipate incurring significant costs associated with commercializing such product candidates. Even if we are able to generate revenues from the sale of any approved products, we may not become profitable and may need to obtain additional funding to continue operations, which may not be available to us on favorable terms, if at all. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would depress the value of our company and could impair our ability to raise capital, expand our business, maintain our research and development efforts, diversify our product offerings or even continue our operations. A decline in the value of our company could also cause you to lose all or part of your investment.

Our gene therapy product candidates are based on novel technology, which makes it difficult to predict the time and cost of product candidate development.*

We have concentrated our product research and development efforts on our gene therapy platform, and our future success depends on the successful development of this therapeutic approach. There can be no assurance that any development problems we experience in the future related to our gene therapy platform will not cause significant delays or unanticipated costs, or that such development problems can be solved. We may also experience delays in developing a sustainable, reproducible and scalable manufacturing process or transferring that process to commercial partners, or developing or validating product release assays in a timely manner, which may prevent us from completing our clinical trials or commercializing our products on a timely or profitable basis, if at all.

In addition, the clinical trial requirements of the FDA, the European Medicines Agency, or EMA, and other regulatory agencies and the criteria these regulators use to determine the safety and efficacy of a product candidate vary substantially according to the type, complexity, novelty and intended use and market of the potential products. The regulatory approval process for novel product candidates such as ours can be more expensive and take longer than for other, better known or extensively studied pharmaceutical or other product candidates. In October 2015, the FDA approved Amgen Inc.'s oncolytic virus therapy, Imlygic (talimogene laherparapvec), for the local treatment of unresectable lesions in patients with melanoma recurrent after initial surgery and in December 2015, Imlygic was approved by the European Commission for early stage, unresectable melanoma that is regionally or distantly metastatic following a recommendation for marketing authorization as a gene therapy in Europe by the Committee for Advanced Therapies. In September and October 2017, the FDA approved the first two CAR T cell therapy products: Novartis' Kymriah (tisagenlecleucel), for the treatment of a type of leukemia and Kite Pharma's Yescarta (axicabtagene ciloleucel), for the treatment of a type of lymphoma, respectively. Two other gene therapy products have been approved in Europe, uniQure NV's Glybera (alipogene tiparvovec), which received marketing authorization from the European Commission in 2012 and GlaxoSmithKline, Fondazione Telethon and Ospedale San Raffaele's Strimvelis, which was approved by the European Commission in 2016. The limited precedent for gene therapy approvals makes it difficult to determine how long it will take or how much it will cost to obtain regulatory approvals for our product candidates in either the United States or Europe.

Regulatory requirements governing gene therapy products have changed frequently and may continue to change in the future. For example, in January 2017, the FDA Oncology Center of Excellence, or the Center of Excellence, was created to leverage the combined skills of regulatory scientists and reviewers with expertise in drugs, biologics, and devices (including diagnostics). While the Center of Excellence is designed to help expedite the development of oncology and malignant hematology-related medical products and support an integrated approach in the clinical evaluation of drugs, biologics and devices for the treatment of cancer, the new Center of Excellence may initially create confusion within the FDA and especially in the Center of Biologics and Research that is the primary review division for our initial product candidate. Gene therapy clinical trials conducted at institutions that receive funding for recombinant DNA research from the U.S. National Institutes of Health, or the NIH, are also subject to review by the NIH Office of Biotechnology Activities' Recombinant DNA Advisory Committee, or the RAC. We have received from time to time questions from the FDA regarding investigational new drug application, or IND, submissions and clinical protocols for Toca 511 & Toca FC. We believe that we have adequately addressed these questions, some of which have caused, in the past, some delays in our clinical trials. Although the FDA decides whether individual gene therapy protocols may proceed, the RAC review process can impede the initiation of a clinical trial, even if the FDA has reviewed the study and approved its initiation. Conversely, the FDA can put an IND on a partial or complete clinical hold even if the RAC has provided a favorable review. Our trials have, in the past, been put on hold for reasons including suspected serious adverse events, which resulted in delays of our trials. Also, before a clinical trial can begin at an NIH-funded institution, that institution's institutional review board, or IRB, and its Institutional Biosafety Committee will have to review the proposed clinical trial to assess the safety of the study. In addition, adverse developments in clinical trials of gene therapy products conducted by others may cause the FDA or other regulatory bodies to change the requirements for performing studies or for obtaining approval of any of our product candidates.

These regulatory review committees and advisory groups, and the new guidelines they promulgate, may lengthen the regulatory review process, require us to perform additional studies, increase our development costs, lead to changes in regulatory positions and interpretations, delay or prevent approval and commercialization of our product candidates or lead to significant post-approval limitations or restrictions. As we advance our product candidates, we will be required to consult with these regulatory and advisory groups and comply with applicable guidelines. Delay or failure to obtain, or unexpected costs in obtaining, the regulatory approval necessary to bring a potential product to market could decrease our ability to generate sufficient revenue to maintain our business.

Failure to successfully develop and obtain approval of our lead product candidate, Toca 511 & Toca FC, or our other future product candidates could adversely affect our future success.*

Our business and future success is substantially dependent on our ability to obtain regulatory approval of and then successfully commercialize our lead product candidate, Toca 511 & Toca FC. Toca 511 & Toca FC is in the early stages of clinical development. All of our product candidates, including Toca 511 & Toca FC, will require additional clinical and nonclinical development, regulatory

review and approval in one or more jurisdictions, substantial investment, access to sufficient pre-commercial and commercial manufacturing capacity and significant marketing efforts before we can generate any revenue from product sales. In addition, because Toca 511 & Toca FC is our most advanced product candidate, and because all of our other future product candidates will likely be based on similar technology, if Toca 511 & Toca FC encounters safety or efficacy problems, developmental delays, regulatory issues or other problems, our development plans and business for our other product candidates would be significantly harmed.

We may have difficulty enrolling patients in our clinical trials, which could delay or prevent development of our product candidates.

Identifying and qualifying patients to participate in clinical trials of our product candidates is critical to our success. The timing of our clinical trials depends on the speed at which we can recruit patients to participate in testing our product candidates. We have experienced delays in some of our clinical trials in the past due to difficulties with enrollment and we may experience similar delays in the future. If patients are unwilling to participate in our clinical trials because of negative publicity from adverse events in the industry or in the trials for other third party product candidates, or for other reasons, including competitive clinical trials for similar patient populations, the timeline for recruiting patients, conducting studies and obtaining regulatory approval of potential products may be delayed. These delays could result in increased costs, delays in advancing our product development, delays in testing the effectiveness of our technology or termination of the clinical trials altogether.

We or our clinical trial sites may not be able to identify, recruit and enroll a sufficient number of patients, or those with the required or desired characteristics in a clinical trial, to complete our clinical trials in a timely manner. Patient enrollment is affected by factors including:

- severity of the disease under investigation;
- design of the clinical trial protocol, including the fact that certain of our clinical trials are randomized to current treatments;
- size of the patient population;
- eligibility criteria for the clinical trial in question;
- perceived risks and benefits of the product candidate under study;
- general level of excitement for the treatment approach;
- comments on social media;
- proximity and availability of clinical trial sites for prospective patients;
- availability of competing therapies and clinical trials;
- efforts to facilitate timely enrollment in clinical trials;
- patient referral practices of physicians; and
- ability to monitor patients adequately during and after treatment.

In particular, recurrent HGG, the condition for which we are initially evaluating our lead product candidate, has a limited number of patients for clinical trials. The eligibility criteria of our clinical trials will further limit the pool of available trial participants. For example, some clinical trials will be limited to patients with recurrent HGG who are scheduled for a repeat resection, for which there are fewer patients. Additionally, the process of finding and diagnosing patients may prove costly. Finally, our treatment necessitates that the patient be near one of our clinical trial sites, since periodic follow-up visits at the clinical trial site are contemplated in the protocols.

We currently plan to seek initial marketing approval in the United States and subsequently Europe and Japan. We may not be able to initiate or continue clinical trials if we cannot enroll a sufficient number of eligible patients to participate in the clinical trials required by the FDA or the EMA or other regulatory agencies. Our ability to successfully initiate, enroll and complete a clinical trial in any foreign country is subject to numerous risks unique to conducting business in foreign countries, including:

- difficulty in establishing or managing relationships with contract research organizations, or CROs, and physicians;
- different standards for the conduct of clinical trials;
- our inability to locate qualified local consultants, physicians and partners; and
- the potential burden of complying with a variety of foreign laws, medical standards and regulatory requirements, including the regulation of pharmaceutical and biotechnology products and treatments.

If we have difficulty enrolling a sufficient number of patients to conduct our clinical trials as planned, we may need to delay, limit or terminate ongoing or planned clinical trials, any of which would have an adverse effect on our business.

The FDA regulatory approval process is lengthy and time-consuming, and we may experience significant delays in the clinical development and regulatory approval of our product candidates. If we are ultimately unable to obtain regulatory approval for our product candidates, our business will be substantially harmed.*

The time required to obtain approval by the FDA and comparable foreign authorities is unpredictable but typically takes many years following the commencement of clinical trials and depends upon numerous factors, including the substantial discretion of the regulatory authorities. In addition, approval policies, regulations or the type and amount of clinical data necessary to gain approval may change during the course of a product candidate's clinical development and may vary among jurisdictions. We have not obtained regulatory approval for any product candidate and it is possible that none of our existing product candidates or any product candidates we may seek to develop in the future will ever obtain regulatory approval.

We have not previously submitted a biologics license application, or BLA, to the FDA, or similar approval filings to comparable foreign authorities. A BLA must include extensive preclinical and clinical data and supporting information to establish the product candidate's safety, purity and potency for each desired indication. The BLA must also include significant information regarding the chemistry, manufacturing and controls for the product. Clinical testing is expensive, time-consuming and uncertain as to outcome. We have experienced in the past delays in the commencement and completion of our clinical trials. We cannot guarantee that any clinical trials will be conducted as planned or completed on schedule, if at all. A failure of one or more clinical trials can occur at any stage of testing. In addition to challenges related to patient enrollment, other events that may prevent successful or timely completion of clinical development include:

- the availability of financial resources to commence and complete our planned clinical trials;
- delays in reaching a consensus with clinical investigators on study design;
- delays in reaching a consensus with regulatory agencies on study design or approval from regulatory authorities to commence a trial;
- reaching agreement on acceptable terms with prospective clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different clinical trial sites;
- delays in obtaining required IRB and/or biologic safety committee approval at each clinical trial site;
- imposition of a clinical hold by regulatory agencies, after an inspection of our clinical trial operations or study sites, or otherwise;
- failure by our CROs, other third parties or us to adhere to clinical trial requirements;
- failure to perform in accordance with the FDA's good clinical practices, or GCP, or applicable regulatory guidelines in other countries;
- failure to adequately acquire, preserve and quality assure clinical trial data;
- delays in the testing, validation, manufacturing and delivery of our product candidates to the clinical sites;
- inadequate shipping or storage of our products, resulting in loss of activity;
- delays in having patients complete participation in a study or return for post-treatment follow-up;
- clinical trial sites dropping out of a study;
- changes in legislation or regulatory requirements and guidance that require amending or submitting new clinical protocols; and
- technical equipment and/or operating room supply limitations at a clinical trial site.

We could also encounter delays if physicians encounter unresolved ethical issues associated with enrolling patients in clinical trials of our product candidates in lieu of prescribing existing treatments that have established safety and efficacy profiles. Further, a clinical trial may be suspended or terminated by us, the IRBs for the institutions in which such clinical trials are being conducted, the Data Safety Monitoring Committee for such clinical trial, by the FDA or other regulatory authorities due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or clinical 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 product candidate, changes in governmental regulations or

administrative actions or lack of adequate funding to continue the clinical trial. If we experience termination of, or delays in the completion of, any clinical trial of our product candidates, the commercial prospects for our product candidates will be harmed, and our ability to generate product revenue will be delayed. In addition, any delays in completing our clinical trials will increase our costs, slow down our product development and approval process and jeopardize our ability to commence product sales and generate revenue.

Any inability to successfully complete preclinical and clinical development could result in additional costs to us or impair our ability to generate revenues from product sales, regulatory and commercialization milestones and royalties. In addition, if we make manufacturing or formulation changes to our product candidates, we may need to conduct additional studies to bridge our modified product candidates to earlier versions. Clinical trial delays could also shorten any periods during which we may have patent protection rights to commercialize our product candidates or allow our competitors to bring products into clinical trials or to market before we do, which could impair our ability to successfully commercialize our product candidates and may harm our business and results of operations.

Our clinical trials may fail to demonstrate safety and efficacy and any of our product candidates could be associated with undesirable side effects or other properties, which would prevent or delay regulatory approval and commercialization.*

Before obtaining marketing approval from regulatory authorities for the sale of our product candidates, we must conduct extensive clinical trials to demonstrate the safety and efficacy of the product candidates in humans. Failure can occur at any time during a clinical trial process. The results of preclinical studies and early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials. There is typically an extremely high rate of attrition from the failure of product candidates proceeding through clinical trials. Product candidates in later stages of clinical trials may fail to show the desired safety and efficacy profile despite having progressed through preclinical testing and initial clinical trials. Most product candidates that commence clinical trials are never approved as products.

In addition, from time to time, we may publish interim, "top-line," initial, or preliminary data from our clinical studies. Interim data from clinical trials are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient data becomes available. Preliminary, initial, or "top-line" data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary data we previously published. As a result, interim, initial, and preliminary data should be viewed with caution until the final data are available. Adverse changes between preliminary, initial, "top-line" or interim data and final data could significantly harm our business prospects. In the 127 patients who received Toca 511 in our on-going Phase 1 clinical trials, treatment-related adverse events were reported in 31.8% of patients and these events were predominantly low grade (25.4%). The most common treatment-related adverse events were fatigue (11.9%), headache (5.6%), and convulsion (4.8%). In the 118 patients who received Toca FC in our on-going Phase 1 clinical trials, treatment-related adverse events were reported in 41.5% of patients and these events were predominantly low grade (38.1%). The most common treatment-related adverse events were fatigue (21.2%), diarrhea (14.4%), and nausea (8.5%). Treatment-related serious adverse events were reported in 4.8% of patients treated with Toca 511 and 2.5% of patients treated with Toca FC. In patients that received both Toca 511 and Toca FC, hematologic toxicity was infrequent and also low grade. Patients treated with our product candidates may also be undergoing surgical, radiation and chemotherapy treatments, which can cause side effects or adverse events that are unrelated to our product candidate, but may still impact the success of our clinical trials. Additionally, our product candidates could potentially cause other adverse events that have not yet been predicted. The inclusion of critically ill patients in our clinical trials may result in deaths or other adverse medical events due to other therapies or medications that such patients may be using or due to the gravity of such patients' illnesses. Patients who will be administered Toca 511 & Toca FC in the HGG clinical trials are seriously or terminally ill and some of them may have immune impairment related to their treatment with temozolomide and dexamethasone. It is expected that some of the patients will die or experience major clinical events such as strokes, hydrocephalus, infections, brain swelling and pulmonary emboli either during the course of our clinical trials or after such trials, which has occurred in the past. In some patients with evidence of drug activity from Toca 511 & Toca FC, new lesions have been observed, some of which continue to grow even with continued Toca FC treatment.

Further, the design of our ongoing Phase 3 clinical trial of Toca 511 & Toca FC was based in part on survival data from similar patients in published trials. The prognosis, unrelated to our treatment, for our patients could be better than for patients in these prior trials, due to improvements in clinical practice, other experimental trials or underappreciated differences in entry criteria. In addition, the clinical or regulatory opinion on what constitutes the standard of care that we have used as the basis for the control arm in this clinical trial may change before we submit the BLA for Toca 511 & Toca FC, if the clinical trial is successful.

It is possible that our RRV product candidates will spread to healthy tissues and result in unknown side effects, and that any anticipated or unanticipated side effects may occur at doses required to achieve clinically relevant efficacy, which could prohibit or delay commercialization of our product candidates. Alternatively, our RRV product candidates might not spread rapidly enough through the tumor or transfer sufficient genetic material to the tumor to demonstrate efficacy sufficient for regulatory approval. In preclinical studies in rodent models, we observed that our vectors do not initially infect tumors in some locations as well as they infect

tumors in other locations, which may limit treatment with our future product candidates to a limited number of cancer locations. Further, it is possible that the RRV might not spread fast enough through the brain cancer to have a beneficial effect or that the virus might not be able to reach certain parts of the tumor due to prior surgical removal of contiguous cancer tissue or from scarring resulting from surgery, chemotherapy, radiation or spontaneous tumor necrosis (cell death) or due to mechanical limitations such as the inability to insert the needle accurately into the tumor; the inability to push enough RRV volume into a tumor with a high pressure; the rapid diffusion of RRV from the injection site due to high intratumor pressure or due to the communication with the ventricular space, external cerebral spinal fluid or the entry into veins; or the inability to insert the needle into the tumor without damaging vital brain structures. It is possible that the cancers which we seek to treat with our product candidates will become resistant to infection with the virus or become resistant to the 5-FU (5-fluorouracil) produced from Toca FC, due to mutation within the cancer cells genes or due to mutation of Toca 511, including loss of the therapeutic gene, cytosine deaminase.

If the results of our clinical trials are inconclusive or if there are safety concerns or adverse events associated with our product candidates, we may:

- be delayed in obtaining marketing approval for our product candidates, if at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or safety warnings;
- be subject to changes with the way the product is administered;
- be required to perform additional clinical trials to support approval or be subject to additional post-marketing testing requirements;
- have regulatory authorities withdraw their approval of the product or impose restrictions on its distribution in the form of a modified Risk Evaluation and Mitigation Strategy, or REMS;
- be subject to product liability or other litigation claims; or
- experience damage to our reputation.

In third-party clinical trials involving other viral vectors for gene therapy, some patients experienced serious adverse events, including the development of leukemia due to vector-related insertional oncogenesis and death. If our vectors demonstrate a similar effect, we may be required to halt or delay clinical development of our product candidates.*

Existing data on the safety and efficacy of gene therapy is very limited and sometimes include historically poor clinical efficacy of previous non-replicating gene therapy products. In addition, there have been publicized safety issues associated with previous gene therapy products in third-party clinical trials, including patient deaths. The results of preclinical and clinical trials performed for our product candidates do not definitively predict safety or efficacy in humans. Possible serious side effects of other viral vector-based gene therapy therapies in general include uncontrolled viral infections and the development of cancer, particularly lymphoma or leukemia.

A significant risk in any gene therapy product based on viral vectors that integrate into the host genome at measurable frequencies is that the vector will insert near cancer-causing oncogenes leading to uncontrolled clonal proliferation of mature cancer cells in the patient. For example, in 2003, 20 patients treated for X-linked severe combined immunodeficiency in two gene therapy studies conducted by third parties using a murine gamma-retroviral vector showed correction of the disease, but the studies were terminated after five patients developed leukemia. The cause of these adverse events was believed to be related to insertional oncogenesis, which is the process whereby the corrected gene inserts near a gene that is important in a critical cellular process like growth or division, and this insertion results in the development of a cancer (often leukemia). A potential clinical concern for gene therapy using retroviral vectors has been the possibility of insertional mutagenesis by the vectors, leading to malignant transformation of transduced cells (i.e., cancer). Because our replicating retroviruses produce viral antigens, these foreign proteins could serve as a target for immune activation against virally-infected cells and inflammation, which is not a feature of non-replicating retroviral vectors. In addition, we have not, and do not plan to, treat patients with severe immunodeficiency with our product candidates. Further, with our lead product candidate, Toca FC kills the virally-infected cells and presents the antigens. We believe that we have not observed oncogenesis in the patients treated in our clinical trials to date for these reasons. Our future product candidates are also designed to activate the immune system against virally-infected cells.

It is possible Toca 511 may spread to non-tumor tissue. We have detected transient and low levels of viral sequences in the saliva of several patients. The risk of insertional mutagenesis or oncogenesis remains a significant concern for gene therapy, and we cannot provide any assurance that it will not occur in any of our current, planned or future clinical trials. There is also the potential risk of delayed adverse events following exposure to gene therapy products due to persistent biological activity of the genetic material

or other components of products used to carry the genetic material. If any such adverse events occur, further advancement of our clinical trials could be halted or delayed, which would have a material adverse effect on our business and operations.

We may not be successful in our efforts to identify or discover additional product candidates from our gene therapy platform.

The success of our business depends primarily upon our ability to identify, develop and commercialize products based on our gene therapy platform. Although our Toca 511 & Toca FC product candidate is currently in clinical development, our research programs may fail to identify other potential product candidates for clinical development. Our research methodology may be unsuccessful in identifying potential product candidates, or our potential product candidates may be shown to have harmful side effects or may have other characteristics that may make the products unmarketable or unlikely to receive marketing approval. If any of these events occur, we may be forced to abandon our development efforts for a program or programs, which would have a material adverse effect on our business and could potentially cause us to cease operations.

We rely, and expect to continue to rely, on third parties to conduct, supervise and monitor our clinical trials, and if these third parties perform in an unsatisfactory manner, it may harm our business.*

We rely on CROs and clinical trial sites to ensure our clinical trials are conducted properly and on time. While we have agreements governing their activities, we may have limited influence over their actual performance. We control only certain aspects of our CROs' activities. Nevertheless, we are responsible for ensuring that each of our clinical trials is conducted in accordance with the applicable protocol, legal, regulatory and scientific standards, and our reliance on the CROs does not relieve us of our regulatory responsibilities.

We and our CROs are required to comply with the GCPs for conducting, recording, auditing and reporting the results of clinical trials to assure that the data and reported results are credible and accurate and that the rights, integrity and confidentiality of clinical trial participants are protected. The FDA enforces these GCPs through periodic inspections of study sponsors, principal investigators and clinical trial sites. If we or our CROs fail to comply with applicable GCPs, the clinical data generated in our future clinical trials may be deemed unreliable, and the FDA may require us to perform additional clinical trials before approving any marketing applications. Upon inspection, the FDA may determine that our clinical trials did not comply with GCPs. In addition, our ongoing and future clinical trials will require a sufficient number of test subjects to evaluate the safety and effectiveness of our product candidates. Accordingly, if our CROs fail to comply with these regulations or fail to recruit a sufficient number of patients, we may be required to repeat such clinical trials, which would delay the regulatory approval process.

Our CROs are not our employees, and we are not able to directly monitor whether or not they devote sufficient time and resources to our clinical and nonclinical programs. These CROs may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical trials or other drug development activities that could harm our competitive position. If our CROs do not successfully carry out their contractual duties or obligations, fail to meet expected deadlines, or if the quality or accuracy of the clinical data they obtain is compromised due to their failure to adhere to our clinical protocols or regulatory requirements, or for any other reasons, our clinical trials may be extended, delayed or terminated, and we may not be able to obtain regulatory approval for or successfully commercialize our product candidates. As a result, our financial results and the commercial prospects for our product candidates would be harmed, our costs could increase and our ability to generate revenues could be delayed.

We expect to continue to rely on third parties to distribute, manufacture and perform release testing for our vectors, product candidates and other key materials and if such third parties do not carry out their contractual duties or meet expected deadlines, we may not be able to obtain regulatory approvals for our product candidates.*

We intend to continue to rely on third-party contract manufacturing organizations, or CMOs, to produce our vectors, product candidates and other key materials and on third-party contract testing organizations, or CTOs, for the establishment and performance of validated product release assays, but we have not entered into binding agreements with any such CMOs or CTOs to support commercialization. Additionally, any CMO may not have experience or availability to produce adequate product candidates at commercial levels and may not achieve the necessary regulatory approvals or produce our vectors and products at the quality, quantities, locations and timing needed to support commercialization. We may change our manufacturing process from the current defined media process to a different defined media process, or from its current equipment to different equipment, or our cell line or vector and there can be no guarantee that the regulatory authorities will approve this new process in a timely manner or ever. Also, as a consequence of the manufacturing change, there may be a requirement to do more preclinical safety or efficacy studies, develop new manufacturing and release assays and/or repeat all or part of the ascending dose safety study in animals or humans. Regulatory requirements ultimately imposed could adversely affect our ability to test, manufacture or market products.

We have not yet secured manufacturing capabilities for commercial quantities of our viral vector. Although we intend to rely on third-party manufacturers for commercialization, we currently utilize a sole-source manufacturer to support our clinical trials. We may be unable to negotiate binding agreements with this manufacturer or additional manufacturers to support our commercialization activities at commercially reasonable terms.

No manufacturer we know of currently has the experience or ability to produce our vectors and product candidates at reasonable commercial levels or under full commercial requirements. We are currently developing a more scalable manufacturing process for Toca 511 & Toca FC, which we plan to transfer to one or more CMOs. We may run into technical or scientific issues related to manufacturing or development that we may be unable to resolve in a timely manner or with available funds. Further, we have not completed the characterization and validation activities necessary for commercial and regulatory approvals. If our manufacturing and testing partners do not satisfy such regulatory requirements, our commercialization efforts may be harmed.

Even if we timely develop a manufacturing process for Toca 511 & Toca FC and successfully transfer it to third-party manufacturers, if such third-party manufacturers are unable to produce viral vectors and our product candidates in the necessary quantities, or in compliance with current good manufacturing practices, or cGMP, or in compliance with pertinent regulatory requirements, and within our planned time frame and cost parameters, the development and sales of our products, if approved, may be materially harmed. The facilities used by our contract manufacturers to manufacture our product candidates must be approved by the FDA pursuant to inspections that will be conducted after we submit our BLA to the FDA. We do not directly control the manufacturing process of, and are completely dependent on, our contract manufacturing partners for compliance with cGMPs for the manufacture of our product candidates. If our contract manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or others, they will not be able to secure and/or maintain regulatory approval for their manufacturing facilities. In addition, we have no control over the ability of our contract manufacturers to maintain adequate quality control, quality assurance and qualified personnel. If the FDA or a comparable foreign regulatory authority does not approve these facilities for the manufacture of our product candidates or if it withdraws any such approval in the future, we may need to find alternative manufacturing facilities, which would significantly impact our ability to develop, obtain regulatory approval for or market our product candidates, if approved. In addition, any failure to achieve and maintain compliance with these laws, regulations and standards could subject us to the risk that we may have to suspend the manufacturing of our product candidates or that obtained approvals could be revoked, which would adversely affect our business and reputation.

In addition, any significant disruption in our supplier relationships could harm our business. We source key materials, devices and equipment from third parties, either directly through agreements with suppliers or indirectly through our manufacturers who have agreements with suppliers. There are a small number of suppliers for certain key materials, equipment, software and components that are used to manufacture our product candidates. Such suppliers may not sell these key materials to our manufacturers at the times or quantities we need them or on commercially reasonable terms. We may not have any control over the process, quality or timing of the acquisition of these key materials by our manufacturers.

We also expect to rely on other third parties to store and distribute our vectors and products for our clinical trials. Any performance failure on the part of our distributors could delay clinical development or marketing approval of our product candidates or commercialization of our products, if approved, producing additional losses and depriving us of potential product revenue.

Our reliance on third parties may require us to share our trade secrets, which increases the possibility that a competitor will discover them or that our trade secrets will be misappropriated or disclosed.

Because we rely on third parties to manufacture our vectors and our product candidates, and because we collaborate with various organizations and academic institutions on the advancement of our gene therapy platform, we must, at times, share trade secrets with them. We seek to protect our proprietary technology in part by entering into confidentiality agreements and, if applicable, material transfer agreements, collaborative research agreements, consulting agreements or other similar agreements with our manufacturers, collaborators, advisors, employees and consultants prior to beginning research or disclosing proprietary information. These agreements typically limit the rights of the third parties to use or disclose our confidential information, such as trade secrets. Despite the contractual provisions employed when working with third parties, the need to share trade secrets and other confidential information increases the risk that such trade secrets become known by our competitors, are inadvertently incorporated into the technology of others, are used inappropriately to create new inventions or are disclosed or used in violation of these agreements. Given that our proprietary position is based, in part, on our know-how and trade secrets, a competitor's discovery of our trade secrets or other unauthorized use or disclosure would impair our competitive position and may have a material adverse effect on our business.

In addition, these agreements typically restrict the ability of our collaborators, advisors, employees and consultants to publish data potentially relating to our trade secrets. Our academic collaborators typically have rights to publish data, provided that we are notified in advance and may delay publication for a specified time in order to secure our intellectual property rights arising from the collaboration. In other cases, publication rights are controlled exclusively by us, although in some cases we may share these rights

with other parties. We also conduct joint research and development programs that may require us to share trade secrets under the terms of our research and development partnerships or similar agreements. Despite our efforts to protect our trade secrets, our competitors may discover our trade secrets through breach of these agreements, independent development or publication of information including our trade secrets in cases where we do not have proprietary or otherwise protected rights at the time of publication. A competitor's discovery of our trade secrets may impair our competitive position and have an adverse impact on our business.

We face intense competition and rapid technological change and the possibility that our competitors may develop therapies that are more advanced or effective than ours, which may adversely affect our financial condition and our ability to successfully commercialize our product candidates.

We are engaged in developing gene therapies and cancer immunotherapies, which are rapidly evolving and fiercely competitive fields. A wide variety of institutions in the United States and internationally, including major multinational pharmaceutical companies, specialty biotechnology companies, academic research departments and public and private institutions, are actively developing potentially competitive technology and products. We face substantial competition from biotechnology and pharmaceutical companies developing products in immunotherapy and our initial proposed indication. Our competitors generally fall into the following categories: companies developing checkpoint inhibitors; companies developing immunotherapies; companies aimed at stimulating immune responses; companies developing CAR and TCR T cells; companies developing oncolytic virus-based technology; and companies with a focus on HGG.

Many of our competitors have substantially greater financial, technical and other resources, such as larger research and development staff and experienced marketing and manufacturing organizations. Accordingly, our competitors may be more successful than us in obtaining approval for treatments and achieving widespread market acceptance, rendering our treatments obsolete or non-competitive. These companies also compete with us in recruiting and retaining qualified scientific and management personnel, establishing clinical trial sites and patient registration for clinical trials and acquiring technologies complementary to, or necessary for, our programs. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies.

If these competitors develop and commercialize more effective, safer or less toxic products than us or if they obtain regulatory approval before us in key geographies, our commercial opportunities could be substantially limited. In addition, adverse clinical outcomes or similar events at gene therapy companies in the past have adversely affected other companies in this field and could also do so in the future at our company.

Even if we obtain regulatory approval of our product candidates, the products may not gain market acceptance among physicians, patients, hospitals, cancer treatment centers, third-party payors and others in the medical community.

Ethical, social and legal concerns about gene therapy and genetic research could result in additional regulations restricting or prohibiting the products and processes we may use. Even with the requisite approvals, the commercial success of our product candidates will depend in part on the medical community, patients, and third-party payors accepting gene therapy products in general, and our product candidates in particular, as medically useful, cost-effective and safe. Any product that we bring to the market may not gain market acceptance by physicians, patients, third-party payors and others in the medical community. If these products do not achieve an adequate level of acceptance, we may not generate significant product revenue and may not become profitable. The degree of market acceptance of these product candidates, if approved for commercial sale, will depend on a number of factors, including:

- the clinical indications for which our product candidates are approved;
- physicians, hospitals, cancer treatment centers and patients considering our product candidates as a safe and effective treatment;
- the potential and perceived advantages of our product candidates over alternative treatments;
- the prevalence and severity of any side effects;
- product labeling or product insert requirements of the FDA or other regulatory authorities;
- limitations or warnings contained in the labeling approved by the FDA;
- the timing of market introduction of our product candidates as well as competitive products;
- the cost of treatment in relation to alternative treatments;
- the availability of adequate coverage, reimbursement and pricing by third-party payors and government authorities;

- the willingness of patients to pay out-of-pocket in the absence of coverage by third-party payors, including government authorities;
- the willingness, ability and availability of healthcare providers that can comply with the transportation, handling, and temperature-controlled storage requirements associated with our product candidates;
- relative convenience and ease of administration, including as compared to alternative treatments and competitive therapies; and
- the effectiveness of our sales and marketing efforts.

Even if a potential product displays a favorable efficacy and safety profile in preclinical and clinical trials, market acceptance of the product will not be known until after it is launched. Our efforts to educate the medical community and third-party payors on the benefits of the product candidates may require significant resources and may never be successful. Such efforts to educate the marketplace may require more resources than are required by the conventional technologies marketed by our competitors and may be restricted by the allowed label.

We are highly dependent on our key personnel, and if we are not successful in attracting and retaining highly qualified personnel, we may not be able to successfully implement our business strategy.

Our ability to compete in the highly competitive biotechnology and pharmaceutical industries depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. We are highly dependent on our management, scientific and medical personnel, including our Chief Executive Officer and our Chief Financial Officer. The loss of the services of any of our executive officers, other key employees and other scientific and medical advisors, and our inability to find suitable replacements, could result in delays in product development and harm our business.

To induce valuable employees to remain at our company, in addition to salary and cash incentives, we have provided stock options that vest over time. The value to employees of stock options that vest over time may be significantly affected by movements in our stock price that are beyond our control and may at any time be insufficient to counteract more lucrative offers from other companies. Despite our efforts to retain them, valuable employees and members of our management, scientific and development teams may terminate their employment with us at any time, with or without notice. We do not have employment agreements with any of our executive officers or other key employees other than employment agreements with Martin J. Duvall and Mark Foletta and a letter agreement with Asha Das, M.D. We do not maintain "key man" insurance policies on the lives of these individuals or the lives of any of our other employees. Our success also depends on our ability to continue to attract, retain and motivate highly skilled scientific and medical personnel.

We will need to expand our organization and we may experience difficulties in managing this growth, which could disrupt our operations.*

As of September 30, 2017, we had 65 full-time employees. As our development and commercialization plans and strategies develop, and as we continue to transition into operating as a public company, we expect to need additional managerial, operational, sales, marketing, financial and other personnel. Future growth would impose significant added responsibilities on members of management. There are a small number of individuals with experience in gene therapy and clinicians who have successfully developed drugs and the competition for such individuals is high. Our future financial performance and our ability to commercialize our product candidates will depend, in part, on our ability to effectively manage any future growth, and our management may also have to divert a disproportionate amount of its attention away from day-to-day activities in order to devote a substantial amount of time to managing these growth activities. We currently rely, and for the foreseeable future will continue to rely on certain independent organizations, advisors and consultants to provide certain services, including substantially all aspects of regulatory approval, clinical management and manufacturing. There can be no assurance that the services of independent organizations, advisors and consultants will continue to be available to us on a timely basis when needed or that we can find qualified replacements. In addition, if we are unable to effectively manage our outsourced activities or if the quality or accuracy of the services provided by consultants is compromised for any reason, our clinical trials may be extended, delayed or terminated, and we may not be able to obtain regulatory approval of our product candidates or otherwise advance our business. There can be no assurance that we will be able to manage our existing consultants or find other competent outside contractors and consultants on economically reasonable terms, or at all.

If we are not able to effectively expand our organization by hiring new employees and expanding our groups of consultants and contractors, we may not be able to successfully implement the tasks necessary to further develop and commercialize our product candidates and, accordingly, may not achieve our research, development and commercialization goals.

We may use our financial and human resources to pursue a particular research program or product candidate and fail to capitalize on programs or product candidates that may be more profitable or for which there is a greater likelihood of success.

Because we have limited resources, we may forego or delay pursuit of opportunities with certain programs or product candidates or for indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future research and development programs for product candidates may not yield any commercially viable products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through strategic collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate, or we may allocate internal resources to a product candidate in a therapeutic area in which it would have been more advantageous to enter into a partnering arrangement.

We currently have a very limited marketing and sales organization. If we are unable to expand our marketing and sales capabilities or enter into agreements with third parties to market and sell our product candidates, we may not be able to generate product revenue.

We currently have very limited sales, marketing and distribution capabilities. At the appropriate time, we plan to build a commercial infrastructure targeting oncologists, neuro-oncologists and neurosurgeons and related clinicians and health care workers in leading and regional cancer centers in the United States, which will require significant capital expenditures, management resources and time. Outside the United States, we may build our own commercial infrastructure or consider opportunities to enter into out-licensing or co-promotion agreements with other pharmaceutical or biotechnology companies to develop and/or commercialize our product candidates outside the United States. We will have to compete with other pharmaceutical and biotechnology companies to recruit, hire, train and retain marketing and sales personnel.

If we are unable or decide not to establish internal sales, marketing and distribution capabilities, we will pursue collaborative arrangements regarding the sales and marketing of our products, however, there can be no assurance that we will be able to establish or maintain such collaborative arrangements, or if we are able to do so, that they will have effective sales forces. Any revenue we receive will depend upon the efforts of such third parties, which may not be successful. We may have little or no control over the marketing and sales efforts of such third parties, and our revenue from product sales may be lower than if we had commercialized our product candidates ourselves. We also face competition in our search for third parties to assist us with the sales and marketing efforts of our product candidates.

There can be no assurance that we will be able to develop in-house sales and distribution capabilities or establish or maintain relationships with third-party collaborators to commercialize any product in the United States or elsewhere.

A variety of risks associated with marketing our product candidates internationally could materially adversely affect our business.

We plan to seek regulatory approval of our product candidates outside of the United States and, accordingly, we expect that we will be subject to additional risks related to operating in foreign countries if we obtain the necessary approvals, including:

- differing regulatory requirements and reimbursement regimes in foreign countries;
- unexpected changes in tariffs, trade barriers, price and exchange controls and other regulatory requirements;
- economic weakness, including inflation, or political instability in particular foreign economies and markets;
- compliance with tax, employment, immigration and labor laws for employees living or traveling abroad;
- foreign taxes, including withholding of payroll taxes;
- foreign currency fluctuations, which could result in increased operating expenses and reduced revenue, and other obligations incident to doing business in another country;
- difficulties staffing and managing foreign operations;
- workforce uncertainty in countries where labor unrest is more common than in the United States;
- potential liability under the Foreign Corrupt Practices Act of 1977 or comparable foreign regulations;
- challenges enforcing our contractual and intellectual property rights, especially in those foreign countries that do not respect and protect intellectual property rights to the same extent as the United States;

- production shortages resulting from any events affecting raw material supply or manufacturing capabilities abroad; and
- business interruptions resulting from geo-political actions, including war and terrorism.

These and other risks associated with our international operations may materially adversely affect our ability to attain or maintain profitable operations.

The terms of our loan and security agreement place restrictions on our operating and financial flexibility.

In October 2015, we entered into a loan and security agreement with Oxford Finance LLC and Silicon Valley Bank that is secured by substantially all of our assets other than our intellectual property (except rights to payment from the sale, licensing or disposition of such intellectual property). We borrowed $18.0 million upon execution of the loan and security agreement.

The loan and security agreement includes affirmative and negative covenants applicable to us and any subsidiaries we create in the future. The affirmative covenants include, among others, covenants requiring us to maintain our legal existence and governmental approvals, deliver certain financial reports, maintain insurance coverage, and subject all of our deposit accounts, securities accounts, commodity accounts or any other bank accounts, to a control agreement in favor of Oxford Finance LLC. The negative covenants include, among others, restrictions on us transferring collateral, incurring additional indebtedness, engaging in mergers or acquisitions, paying dividends in cash or making other distributions, making investments, creating liens, selling assets, and suffering a change in control, in each case subject to certain exceptions.

The loan and security agreement also includes events of default, the occurrence and continuation of which provide Oxford Finance LLC, as collateral agent, with the right to exercise remedies against us and the collateral securing the loans under the loan and security agreement, including foreclosure against our properties securing the loan and security agreement, including our cash, potentially requiring us to renegotiate our agreement on terms less favorable to us or to immediately cease operations. These events of default include, among other things, our failure to pay any amounts due under the loan and security agreement, a breach of covenants under the loan and security agreement, our insolvency, impairment in the perfection or priority of each lender's security interest in the collateral, the occurrence of any default under certain other indebtedness in an amount greater than $250,000, our failure to obtain or maintain material governmental approvals, and a final judgment against us of at least $250,000. Further, if we are liquidated, the lender's right to repayment would be senior to the rights of the holders of our common stock to receive any proceeds from the liquidation. The lenders could declare a default upon the occurrence of any event that they interpret as a material adverse change as defined under the loan and security agreement, thereby requiring us to repay the loan immediately or to attempt to reverse the declaration of default through negotiation or litigation. Any declaration by the lenders of an event of default could significantly harm our business and prospects and could cause the price of our common stock to decline.

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

We face an inherent risk of product liability as a result of the clinical testing of our product candidates and will face an even greater risk if we commercialize any products. For example, we may be sued if our product candidates cause or are perceived to cause injury or are found to be otherwise unsuitable during clinical 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 or 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 product candidates;
- injury to our reputation;
- withdrawal of clinical trial participants;
- initiation of investigations by regulators;
- costs to defend the related litigation;
- a diversion of management's time and our resources;
- substantial monetary awards to clinical trial participants or patients;
- product recalls, withdrawals or labeling, marketing or promotional restrictions;

- exhaustion of any available insurance and our capital resources;
- loss of revenue;
- the inability to commercialize any product candidate; and
- a decline in our share price.

Our inability to obtain sufficient product liability insurance at an acceptable cost to protect against potential product liability claims could prevent or inhibit the commercialization of any products we develop, alone or with corporate collaborators. We currently carry $5 million of product liability insurance covering our clinical trials. Although we maintain such insurance, our insurance policies may have various exclusions, and we may be subject to a product liability claim for which we have no coverage. We may 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. Even if our agreements with any future corporate collaborators entitle us to indemnification against losses, such indemnification may not be available or adequate should any claim arise.

Negative public opinion and increased regulatory scrutiny of gene therapy and genetic research may damage public perception of our product candidates or adversely affect our ability to conduct our business or obtain regulatory approvals for our product candidates.

Public perception may be influenced by claims that gene therapy is unsafe, and gene therapy may not gain the acceptance of the public or the medical community. In particular, our success will depend upon physicians specializing in the treatment of those diseases that our product candidates target prescribing treatments that involve the use of our product candidates in lieu of, or in addition to, existing treatments with which they are already familiar with and for which greater clinical data may be available. More restrictive government regulations or negative public opinion would have a negative effect on our business or financial condition and may delay or impair the development and commercialization of our product candidates or demand for any products we may develop. Adverse events in our clinical trials, even if not ultimately attributable to our product candidates, and the resulting publicity could lead to increased governmental regulation, unfavorable public perception, potential regulatory delays in the testing or approval of our potential product candidates, stricter labeling requirements for those product candidates that are approved and a decrease in demand for any such product candidates. Concern about environmental spread of our product, whether real or anticipated, may hinder the commercialization of our products.

Our internal computer systems, or those used by our CROs, SaaS providers, contractors or consultants, may fail or suffer security breaches.

Despite the implementation of security measures, our internal computer systems and those of our CROs, SaaS providers, contractors and consultants are vulnerable to damage from computer viruses and unauthorized access. While we have not experienced any such material system failure or security breach to date, if such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our development programs and our business operations. For example, the loss of clinical trial data from completed or future clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability, and the further development and commercialization of our product candidates could be delayed.

Business disruptions could seriously harm our future revenue and financial condition and increase our costs and expenses.

Our operations, and those of our CROs, contractors and consultants, could be subject to power shortages, telecommunications failures, wildfires, water shortages, floods, earthquakes, hurricanes, typhoons, fires, extreme weather conditions, medical epidemics and other natural or man-made disasters or business interruptions for which we are predominantly self-insured. The occurrence of any of these business disruptions could seriously harm our operations and financial condition and increase our costs and expenses. Our ability to obtain clinical supplies of our product candidates could be disrupted if the operations of our contract manufacturers or cell line storage facilities are affected by a man-made or natural disaster or other business interruption.

Risks related to government regulation

The FDA may disagree with our regulatory plans, and we may fail to obtain regulatory approval of our product candidates.*

Following receipt of Breakthrough Therapy Designation from the FDA, we redesigned our ongoing Phase 2/3 clinical trial of Toca 511 & Toca FC for the treatment of recurrent HGG to be a single Phase 3 trial and are including the 187 patients that were previously enrolled in the Phase 2/3 trial in the total of 380 patients expected to enroll in the redesigned trial. The interim or final

analyses of this trial alone could support approval of a BLA for Toca 511 & Toca FC in the indication of recurrent HGG. However, the general approach for FDA approval of a new biologic or drug is to require dispositive data from two adequate and well-controlled Phase 3 clinical trials of the biologic or drug in the relevant patient population.

In addition, we believe that it is likely that there may be a regulatory requirement for one or more diagnostic assays to monitor treatment, especially for the presence of Toca 511 & Toca FC or their components or derivatives. We plan to meet with the FDA to discuss the development of such assays, and it is possible that the FDA may require a separate regulatory approval for such assays contemporaneously with the approval of Toca 511 & Toca FC.

Our clinical trials results may not support approval. In addition, Toca 511 & Toca FC and our other product candidates could fail to receive regulatory approval for many reasons, including the following:

- the FDA or comparable foreign regulatory authorities may disagree with the design or implementation of our clinical trials, including clinical endpoints;
- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for approval;
- we may be unable to demonstrate that our product candidates' clinical and other benefits outweigh their safety risks or are better than recently produced safety or efficacy data for other products;
- we may encounter serious and unexpected adverse events during clinical trials that render our products unsafe for use in humans;
- the FDA or comparable foreign regulatory authorities may disagree with our interpretation of data from preclinical studies or clinical trials;
- the data collected from clinical trials of our product candidates may not be sufficient to the satisfaction of the FDA or comparable foreign regulatory authorities to support the submission of a BLA or other comparable submission in foreign jurisdictions or to obtain regulatory approval in the United States or elsewhere;
- the FDA or comparable foreign regulatory authorities may fail to approve our manufacturing processes and/or facilities of third-party manufacturers with which we contract for clinical and commercial supplies; and
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

Obtaining and maintaining regulatory approval of our product candidates in one jurisdiction does not mean that we will be successful in obtaining regulatory approval of our product candidates in other jurisdictions.

Obtaining and maintaining regulatory approval of our product candidates in one jurisdiction does not guarantee that we will be able to obtain or maintain regulatory approval in any other jurisdiction, while a failure or delay in obtaining regulatory approval in one jurisdiction may have a negative effect on the regulatory approval process in others. For example, even if the FDA grants marketing approval of a product candidate, comparable regulatory authorities in foreign jurisdictions must also approve the manufacturing, marketing and promotion of the product candidate in those countries. Approval procedures vary among jurisdictions and can involve requirements and administrative review periods different from, and greater than, those in the United States, including additional preclinical studies or clinical trials. Studies and clinical trials conducted in one jurisdiction or study group may not be accepted by regulatory authorities in other jurisdictions. In many jurisdictions outside the United States, a product candidate must be approved for reimbursement before it can be approved for sale in that jurisdiction. In some cases, the price that we intend to charge for our products is also subject to approval.

We may also submit marketing applications in other countries. Regulatory authorities in jurisdictions outside of the United States have requirements for approval of product candidates with which we must comply prior to marketing in those jurisdictions. Obtaining approvals in one jurisdiction does not guarantee that we will be able to obtain approval in any other jurisdiction, but the failure to obtain approval in a jurisdiction may have a negative impact on our ability to obtain approval in other jurisdictions. Obtaining foreign regulatory approvals and compliance with foreign regulatory requirements could result in significant delays, difficulties and costs for us and could delay or prevent the introduction of our products in certain countries. If we fail to comply with the regulatory requirements in international markets and/or receive applicable marketing approvals, our target market will be reduced and our ability to realize the full market potential of our product candidates will be harmed.

Additional time may be required to obtain regulatory approval for Toca 511 & Toca FC because it is a combination product.

We believe our Toca 511 & Toca FC product candidate is regulated as a drug/biologic combination product, which will require coordination within the FDA and similar foreign regulatory agencies for review of their biologic and drug components and potentially one or more diagnostic assays to monitor treatment. Although the FDA and similar foreign regulatory agencies have systems in place for the review and approval of combination products such as ours, we may experience delays in the development and commercialization of our product candidates due to regulatory timing constraints and uncertainties in the product development and approval process.

Even if we receive regulatory approval of our product candidates, we will be subject to ongoing regulatory obligations and continued regulatory review, which may result in significant additional expense, and we may be subject to penalties and/or withdrawal of product approval if we fail to comply with regulatory requirements or experience unanticipated problems with our product candidates.

Any regulatory approvals that we receive for our product candidates will require surveillance to monitor the safety and efficacy of the product candidate. Specifically, we believe that it is likely that there may be a regulatory requirement for one or more diagnostic assays to monitor treatment, especially for the presence of Toca 511 or Toca FC or their components or derivatives. We plan to meet with the FDA to discuss the development of such assays, and it is possible that the FDA may require a separate regulatory approval for such assays. Further, each vector containing a particular gene could be regulated as a separate biologic depending on its intended use and FDA policy. The FDA may also require a REMS, in order to approve our product candidates, which could entail requirements for a medication guide, physician communication plans or additional elements to ensure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. In addition, if the FDA or a comparable foreign regulatory authority approves our product candidates, the manufacturing processes, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion, import, export and record keeping for our product candidates will be subject to extensive and ongoing regulatory requirements. These requirements include, among other things, submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with cGMPs for manufacturing and GCPs for any clinical trials that we conduct post-approval. Later discovery of previously unknown problems with our product candidates, 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 our product candidates, withdrawal of the product from the market, or voluntary or mandatory product recalls;
- fines, warning letters or holds on clinical trials;
- refusal by the FDA to approve pending applications or supplements to approved applications filed by us or suspension or revocation of license approvals;
- suspension or termination of manufacturing at one or more manufacturing facilities;
- product seizure or detention, or refusal to permit the import or export of our product candidates; and
- injunctions or the imposition of civil or criminal penalties.

The FDA's and other regulatory authorities' policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates. For example, in December 2016, the 21st Century Cures Act, or Cures Act, was signed into law. The Cures Act, among other things, is intended to modernize the regulation of drugs and biologics and spur innovation, and it contains provisions specific to the development and review of combination products. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative action, either in the United States or abroad. For example, certain policies of the Trump administration may impact our business and industry. Namely, the Trump administration has taken several executive actions, including the issuance of a number of Executive Orders, that could impose significant burdens on, or otherwise materially delay, the FDA's ability to engage in routine regulatory and oversight activities such as implementing statutes through rulemaking, issuance of guidance, and review and approval of marketing applications. Notably, on January 23, 2017, President Trump ordered a hiring freeze for all executive departments and agencies, including the FDA, which prohibits the FDA from filling employee vacancies or creating new positions. Under the terms of the order, the freeze will remain in effect until implementation of a plan to be recommended by the Director for the Office of Management and Budget, or OMB, in consultation with the Director of the Office of Personnel Management, to reduce the size of the federal workforce through attrition. An under-staffed FDA could result in delays in the FDA's responsiveness or in its ability to review submissions or applications, issue regulations or guidance, or implement or enforce regulatory requirements in a timely fashion or at all. Moreover, on January 30, 2017, President Trump issued an Executive Order, applicable to all executive agencies, including the FDA, that requires that for each notice of proposed rulemaking or final regulation to be issued in fiscal year 2017, the agency shall identify at least two existing regulations to be repealed, unless prohibited by law. These requirements are referred to as the "two-for-one" provisions. This Executive Order includes a budget neutrality provision that requires the total incremental cost of all new regulations in the 2017 fiscal

year, including repealed regulations, to be no greater than zero, except in limited circumstances. For fiscal years 2018 and beyond, the Executive Order requires agencies to identify regulations to offset any incremental cost of a new regulation. In interim guidance issued by the Office of Information and Regulatory Affairs within OMB on February 2, 2017, the administration indicates that the "two-for-one" provisions may apply not only to agency regulations, but also to significant agency guidance documents. It is difficult to predict how these requirements will be implemented, and the extent to which they will impact the FDA's ability to exercise its regulatory authority. If these executive actions impose constraints on the FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted. In addition, if we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained and we may not achieve or sustain profitability.

We have Orphan-Drug Designation for Toca 511 & Toca FC for the treatment of malignant glioma in addition to glioblastoma multiforme, or GBM, but we may be unable to maintain the benefits associated with Orphan-Drug Designation, including potential eligibility for any future market exclusivity.*

Under the Orphan-Drug Act, the FDA may grant orphan designation to a drug or biologic intended to treat a rare disease or condition, which is defined as one occurring in a patient population of fewer than 200,000 in the United States, or a patient population greater than 200,000 in the United States for which there is no reasonable expectation that the cost of developing and making available in the United States a drug or biologic for a disease or condition will be recovered from sales in the United States for that drug or biologic. In the United States, Orphan-Drug Designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. In addition, if a product that has Orphan-Drug Designation subsequently receives the first FDA approval for the disease for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications to market the same biologic for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity or where the manufacturer is unable to assure sufficient product quantity.

Toca 511 & Toca FC has Orphan-Drug Designation in the United States for the treatment of malignant glioma in addition to GBM. However, we are currently developing this product candidate for the treatment of recurrent HGG, of which GBM is a subset. Exclusive marketing rights in the United States may be limited if we seek approval for an indication broader than the orphan designated indication and may be lost if the FDA later determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition. Further, even if we obtain orphan drug exclusivity for a product, that exclusivity may not effectively protect the product from competition because different products with different active moieties can be approved for the same condition. Even after an orphan product is approved, the FDA can subsequently approve the same product with the same active moiety for the same condition if the FDA concludes that the later product is safer, more effective or makes a major contribution to patient care. Orphan-Drug Designation neither shortens the development time or regulatory review time of a drug or biologic nor gives the drug or biologic any advantage in the regulatory review or approval process. In addition, while we may seek orphan designation for other product candidates, we may never receive such designations.

A Fast Track Designation or Breakthrough Therapy Designation by the FDA or a Priority Medicine or PRIME Designation by the EMA, may not actually lead to a faster development or regulatory review or approval process.*

If a product candidate is intended for the treatment of a serious or life-threatening condition and demonstrates the potential to address unmet medical needs for this condition, the drug sponsor may apply for FDA Fast Track Designation. Similarly, Breakthrough Therapy Designation may be granted by the FDA, or PRIME Designation may be granted by the EMA, to product candidates for serious conditions that have preliminary clinical evidence indicating the product candidate may offer substantial improvement over available therapy. The FDA and EMA have broad discretion whether or not to grant these designations, and even if we believe a particular product candidate is eligible for these designations, we cannot assure you that the FDA or EMA would decide to grant them. We have been granted Fast Track Designation and Breakthrough Therapy Designation for our Toca 511 & Toca FC product candidate for the treatment of recurrent HGG and PRIME designation for Toca 511 in HGG, but this is no assurance we will receive these designations for any future product candidates. Further, even though we have received these designations for Toca 511 & Toca FC, we may not experience a faster development process, review or approval compared to conventional FDA or EMA procedures. The FDA or EMA may withdraw these designations if it believes that they are no longer supported by data from our clinical development program.

Our Toca 511 & Toca FC product may face competition sooner than anticipated, if approved.

The Biologics Price Competition and Innovation Act of 2009, or BPCIA, created an abbreviated approval pathway for biological products that are biosimilar to or interchangeable with an FDA-licensed reference biological product. Under the BPCIA, an application for a biosimilar product may not be submitted to the FDA until four years following the date that the reference product was first licensed by the FDA. In addition, the approval of a biosimilar product may not be made effective by the FDA until 12 years from the date on

which the reference product was first licensed. During this 12-year period of exclusivity, another company may still market a competing version of the reference product if the FDA approves a full BLA for the competing product containing the sponsor's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity and potency of its product. The law is complex and is still being interpreted and implemented by the FDA. As a result, its ultimate impact, implementation and meaning are subject to uncertainty. While it is uncertain when such processes intended to implement BPCIA may be fully adopted by the FDA, any such processes could have a material adverse effect on the future commercial prospects for our biological products.

We believe that any of our product candidates approved as a biological product under a BLA should qualify for the 12-year period of exclusivity. However, there is a risk that this exclusivity could be shortened due to congressional action or otherwise, or that the FDA will not consider our product candidates to be reference products for competing products, potentially creating the opportunity for competition sooner than anticipated. Other aspects of the BPCIA, some of which may impact the BPCIA exclusivity provisions, have also been the subject of recent litigation. Moreover, the extent to which a biosimilar, once approved, will be substituted for any one of our reference products in a way that is similar to traditional generic substitution for non-biological products is not yet clear, and will depend on a number of marketplace and regulatory factors that are still developing.

We may be subject, directly or indirectly, to federal and state healthcare fraud and abuse laws, false claims laws and other federal and state healthcare laws, and the failure to comply with such laws could result in substantial penalties. Our employees, independent contractors, consultants, principal investigators, CROs, commercial partners and vendors may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements.*

We are exposed to the risk of fraud, misconduct or other illegal activity by our employees, independent contractors, consultants, principal investigators, CROs, commercial partners and vendors. Misconduct by these parties could include intentional, reckless and/or negligent conduct that fails to: comply with the laws of the FDA and other similar foreign regulatory bodies; provide true, complete and accurate information to the FDA and other similar foreign regulatory bodies; comply with manufacturing standards we have established; comply with federal and state data privacy, security, fraud and abuse and other healthcare laws and regulations in the United States and similar foreign fraudulent misconduct laws; or report financial information or data accurately or to disclose unauthorized activities to us. If we obtain FDA approval for any of our product candidates and begin commercializing those products in the United States, our potential exposure under such laws would increase significantly, and our costs associated with compliance with such laws would likely also increase. These laws may impact, among other things, our current activities with principal investigators and research patients, as well as proposed and future sales, marketing and education programs. In particular, the promotion, sales and marketing of healthcare items and services, as well as certain business arrangements in the healthcare industry, are subject to extensive laws and regulations intended to prevent fraud, misconduct, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, including off-label uses of our products, structuring and commission(s), certain customer incentive programs and other business arrangements generally. Activities subject to these laws also involve the improper use or misrepresentation of information obtained in the course of patient recruitment for clinical trials, creating fraudulent data in our preclinical studies or clinical trials or illegal misappropriation of drug product, which could result in regulatory sanctions and cause serious harm to our reputation. The laws that may affect our ability to operate include, but are not limited to:

- the Federal Anti-Kickback Statute, which prohibits, among other things, individuals and entities from knowingly and willfully soliciting, receiving, offering or paying any remuneration (including any kickback, bribe, or rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce, or in return for, either the referral of an individual for, or the purchase, lease, order or recommendation of, any good, facility, item or service for which payment may be made, in whole or in part, under a federal healthcare program, such as the Medicare and Medicaid programs. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- federal civil and criminal false claims laws and civil monetary penalty laws, including the civil False Claims Act, which impose criminal and civil penalties, through government, civil whistleblower or qui tam actions, on individuals and entities for, among other things, knowingly presenting, or causing to be presented, claims for payment or approval from Medicare, Medicaid, or other third-party payors that are false, fictitious or fraudulent, or knowingly making, using or causing to be made or used, a false statement to avoid, decrease or conceal an obligation to pay money to the federal government. In addition, the government may assert that a claim including items and services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the False Claims Act;

- the Federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which imposes criminal and civil liability for, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud or to obtain any healthcare benefit program or obtain, by means of false or fraudulent pretenses, representations, or promises, any of the money or property owned by, or under the custody or control of, any healthcare benefit program, regardless of the payor (e.g., public or private), willfully obstructing a criminal investigation of a healthcare offense, and knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false, fictitious or fraudulent statements in connection with the delivery of, or payment for, healthcare benefits, items or services relating to healthcare matters. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, which impose requirements on certain covered healthcare providers, health plans, and healthcare clearinghouses, as well as their respective business associates that perform services for them that involve the creation, use, maintenance or disclosure of, individually identifiable health information, relating to the privacy, security and transmission of individually identifiable health information without appropriate authorization;
- the federal physician payment transparency requirements, sometimes referred to as the "Physician Payments Sunshine Act," created under the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, collectively the Affordable Care Act, and its implementing regulations, which require certain manufacturers of drugs, devices, biologics and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) to report annually to the United States Department of Health and Human Services, or HHS, information related to payments or other transfers of value made to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members;
- the U.S. Federal Food, Drug and Cosmetic Act, or FDCA, which prohibits, among other things, the adulteration or misbranding of drugs and medical devices; and
- federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers.

Additionally, we are subject to state and foreign equivalents of each of the healthcare fraud and abuse laws described above, among others, some of which may be broader in scope and may apply regardless of the payor. We may also be subject to state and foreign laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government or otherwise restrict payments that may be made to healthcare providers; and to report information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures. We may also be subject to state and foreign laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent inappropriate conduct may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. We are also subject to the risk that a person or government could allege such fraud or other misconduct, even if none occurred. Efforts to ensure that our business arrangements will comply with applicable healthcare laws and regulations will involve substantial costs. It is possible that governmental and enforcement authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law interpreting applicable fraud and abuse or other healthcare laws and regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of civil, criminal and administrative penalties, damages, disgorgement, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, individual imprisonment, additional reporting obligations and oversight if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws, and curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations. In addition, the approval and commercialization of any of our product candidates outside the United States will also likely subject us to foreign equivalents of the healthcare laws mentioned above, among other foreign laws.

Coverage and reimbursement may be limited or unavailable in certain market segments for our product candidates, if approved, which could make it difficult for us to sell our product candidates profitably.

Successful sales of our product candidates, if approved, depend on the availability of coverage and adequate reimbursement from third-party payors. In addition, because our product candidates represent new approaches to the treatment of cancer, we cannot be sure that coverage and reimbursement will be available for, or accurately estimate the potential revenue from, our product candidates.

Patients who are provided medical treatment for their conditions generally rely on third-party payors to reimburse all or part of the costs associated with their treatment. Coverage and adequate reimbursement from governmental healthcare programs, such as Medicare and Medicaid, and commercial payors are critical to new product acceptance.

Government authorities and other third-party payors, such as private health insurers and health maintenance organizations, decide which drugs and treatments they will cover and the amount of reimbursement. Coverage and reimbursement by a third-party payor may depend upon a number of factors, including, but not limited to, the third-party payor's determination that use of a product is:

- a covered benefit under its health plan;
- safe, effective and medically necessary;
- appropriate for the specific patient;
- cost-effective; and
- neither experimental nor investigational.

In the United States, no uniform policy of coverage and reimbursement for products exists among third-party payors, and coverage and reimbursement for products can differ significantly from payor to payor. As a result, obtaining coverage and reimbursement approval of a product from a government or other third-party payor is a time-consuming and costly process that could require us to provide to each payor supporting scientific, clinical and cost-effectiveness data for the use of our products and to justify the level of coverage and reimbursement relative to other therapies, with no assurance that coverage and adequate reimbursement will be obtained. Third party payors may also have difficulty in determining the appropriate coverage of our product candidates, if approved, due to the fact that they are combination products that include a small molecule drug. To the extent there are any delays in determining such coverage or inadequate coverage and reimbursement for all aspects of our combination therapies, it would adversely affect the market acceptance, demand and use of our product candidates. Any denial in coverage or reduction in reimbursement from Medicare or other government programs may result in a similar denial or reduction in payments from private payors, which may adversely affect our future profitability.

We intend to seek approval to market our product candidates in both the United States and in selected foreign jurisdictions. If we obtain approval in one or more foreign jurisdictions for our product candidates, we will be subject to rules and regulations in those jurisdictions. In some foreign countries, particularly those in the European Union, the pricing of biologics is subject to governmental control and other market regulations which could put pressure on the pricing and usage of our product candidates. In these countries, pricing negotiations with governmental authorities can take considerable time after obtaining marketing approval of a product candidate. In addition, market acceptance and sales of our product candidates will depend significantly on the availability of coverage and adequate reimbursement from third-party payors for our product candidates and may be affected by existing and future health care reform measures.

Healthcare legislative reform measures may have a material adverse effect on our business and results of operations.*

Third-party payors, whether domestic or foreign, or governmental or commercial, are developing increasingly sophisticated methods of controlling healthcare costs. In both the United States and certain foreign jurisdictions, there have been a number of legislative and regulatory changes to the health care system that could impact our ability to sell our products profitably. In particular, in 2010, the Affordable Care Act was enacted in the United States. The Affordable Care Act and its implementing regulations, among other things, subjected biological products to potential competition by lower-cost biosimilars, revised the methodology by which rebates owed by manufacturers to the state and federal government for covered outpatient drugs and certain biologics, including our product candidates, under the Medicaid Drug Rebate Program are calculated, increased the minimum Medicaid rebates owed by most manufacturers under the Medicaid Drug Rebate Program, extended the Medicaid Drug Rebate program to utilization of prescriptions of individuals enrolled in Medicaid managed care organizations, subjected manufacturers to new annual fees and taxes for certain branded prescription drugs, and provided incentives to programs that increase the federal government's comparative effectiveness research. Since its enactment, there have been judicial and Congressional challenges to certain aspects of the Affordable Care Act, and

we expect there will be additional challenges and amendments to the Affordable Care Act in the future, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the Affordable Care Act. Since January 2017, President Trump has signed two Executive Orders designed to delay the implementation of any certain provisions of the Affordable Care Act or otherwise circumvent some of the requirements for health insurance mandated by the Affordable Care Act. The Trump administration has also announced that it will discontinue the payment of cost-sharing reduction, or CSR, payments to insurance companies until Congress approves the appropriation of funds for the CSR payments. The loss of the CSR payments is expected to increase premiums on certain policies issued by qualified health plans under the Affordable Care Act. A bipartisan bill to appropriate funds for CSR payments has been introduced in the Senate, but the future of that bill is uncertain. In addition, CMS has recently proposed regulations that would give states greater flexibility in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the Affordable Care Act for plans sold through such marketplaces. Further, each chamber of Congress has put forth multiple bills this year designed to repeal or repeal and replace portions of the Affordable Care Act. Although none of these measures has been enacted by Congress to date, Congress may consider other legislation to repeal and replace elements of the Affordable Care Act. In January 2017, President Trump signed an Executive Order directing federal agencies with authorities and responsibilities under the Affordable Care Act to waive, defer, grant exemptions from, or delay the implementation of any provision of the Affordable Care Act that would impose a fiscal or regulatory burden on states, individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. The U.S. House of Representatives passed legislation known as the American Health Care Act of 2017 in May 2017. More recently, the Senate Republicans introduced and then updated a bill to replace the Affordable Care Act known as the Better Care Reconciliation Act of 2017. The Senate Republicans also introduced legislation to repeal the Affordable Care Act without companion legislation to replace it, and a "skinny" version of the Better Care Reconciliation Act of 2017. Each of these measures was rejected by the full Senate. Congress will likely consider other legislation to replace elements of the Affordable Care Act. We continue to evaluate the effect that the Affordable Care Act and its possible repeal and replacement has on our business. It is uncertain the extent to which any such changes may impact our business or financial condition.

In addition, other legislative changes have been proposed and adopted in the United States since the Affordable Care Act was enacted. In August 2011, the Budget Control Act of 2011, among other things, created measures for spending reductions by Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least $1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation's automatic reduction to several government programs. This includes aggregate reductions of Medicare payments to providers up to 2% per fiscal year, which went into effect on April 1, 2013 and, due to the Bipartisan Budget Act of 2015, will stay in effect through 2025 unless Congressional action is taken. In January 2013, President Obama signed into law the American Taxpayer Relief Act of 2012, which, among other things, reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. Moreover, payment methodologies including payment for any companion diagnostics may be subject to changes in healthcare legislation and regulatory initiatives. For example, the Centers for Medicare and Medicaid Services, or CMS, began bundling the Medicare payments for certain laboratory tests ordered while a patient received services in a hospital outpatient setting and, beginning in 2018, CMS will pay for clinical laboratory services based on a weighted-average of reported prices that private payors, Medicare Advantage plans and Medicaid Managed Care plans pay for laboratory services. Recently, there has been heightened governmental scrutiny over the manner in which drug manufacturers set prices for their marketed products, which has resulted in several Congressional inquiries and proposed bills designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drug products.

There have been, and likely will continue to be, legislative and regulatory proposals at the foreign, federal and state levels directed at broadening the availability of healthcare and containing or lowering the cost of healthcare. We cannot predict the initiatives that may be adopted in the future. The continuing efforts of the government, insurance companies, managed care organizations and other payors of healthcare services to contain or reduce costs of healthcare and/or impose price controls may adversely affect:

- the demand for our product candidates, if we obtain regulatory approval;
- our ability to set a price that we believe is fair for our products;
- our ability to generate revenue and achieve or maintain profitability;
- the level of taxes that we are required to pay; and
- the availability of capital.

Due to the novel nature of our technology and the small size of our initial target patient populations, we face uncertainty related to pricing and reimbursement for these product candidates.

Our initial target patient populations are relatively small. As a result, the pricing and reimbursement of our product candidates, if approved, must be adequate to support commercial infrastructure. If we are unable to obtain adequate levels of reimbursement, our ability to successfully market and sell our product candidates will be adversely affected. The manner and level at which reimbursement is provided for services related to our product candidates (e.g., for administration of our product to patients) is also important. Inadequate reimbursement for such services may lead to physician resistance and adversely affect our ability to market or sell our products.

We and our contract manufacturers are subject to significant regulation with respect to manufacturing our products. The manufacturing facilities on which we rely may not continue to meet regulatory requirements and have limited capacity.

We currently have relationships with a limited number of suppliers for the manufacturing of our viral vectors and product candidates. Each supplier may require licenses to manufacture such components if such processes are not owned by the supplier or in the public domain and we may be unable to transfer or sublicense the intellectual property rights we may have or later obtain with respect to such activities.

All entities involved in the preparation of therapeutics for clinical trials or commercial sale, including our existing contract manufacturers for our product candidates, are subject to extensive regulation. Components of a finished therapeutic product approved for commercial sale or used in late-stage clinical trials must be manufactured in accordance with cGMP. These regulations govern manufacturing processes and procedures (including record keeping) and the implementation and operation of quality systems to control and assure the quality of investigational products and products approved for sale. Poor control of production processes can lead to the introduction of adventitious agents or other contaminants, or to inadvertent changes in the properties or stability of our product candidates that may not be detectable in final product testing. We or our contract manufacturers must supply all necessary documentation in support of a BLA on a timely basis and must adhere to the FDA's good laboratory practices and cGMP regulations enforced by the FDA through its facilities inspection program. Some of our contract manufacturers have not produced a commercially-approved product and therefore may have not obtained the requisite FDA approvals to do so. Our facilities and quality systems and the facilities and quality systems of some or all of our third-party contractors must pass a pre-approval inspection for compliance with the applicable regulations as a condition of regulatory approval of our product candidates or any of our other potential products. In addition, the regulatory authorities may, at any time, audit or inspect a manufacturing facility involved with the preparation of our product candidates or our other potential products or the associated quality systems for compliance with the regulations applicable to the activities being conducted. If these facilities do not pass a pre-approval plant inspection, FDA approval of the products may not be granted.

The regulatory authorities also may, at any time following approval of a product for sale, audit our manufacturing facilities or those of our third-party contractors. If any such inspection or audit identifies a failure to comply with applicable regulations or if a violation of our product specifications or applicable regulations occurs independent of such an inspection or audit, we or the relevant regulatory authority may require remedial measures that may be costly and/or time-consuming for us or a third party to implement and that may include the temporary or permanent suspension of a clinical trial or commercial sales or the temporary or permanent closure of a facility. Any such remedial measures imposed upon us or third parties with whom we contract could materially harm our business.

If we or any of our third-party manufacturers fail to maintain regulatory compliance, the FDA can impose regulatory sanctions including, among other things, refusal to approve a pending application for a new drug product or biologic product or revocation of a pre-existing approval. As a result, our business, financial condition and results of operations may be materially harmed.

Additionally, if supply from one approved manufacturer is interrupted, there could be a significant disruption in commercial supply. An alternative manufacturer would need to be qualified through a BLA supplement which could result in further delay. The regulatory agencies may also require additional studies if a new manufacturer is relied upon for commercial production. Switching manufacturers may involve substantial costs and is likely to result in a delay in our desired clinical and commercial timelines.

These factors could cause the delay of clinical trials, regulatory submissions, required approvals or commercialization of our product candidates, cause us to incur higher costs and prevent us from commercializing our products successfully. Furthermore, if our suppliers fail to meet contractual requirements, and we are unable to secure one or more replacement suppliers capable of production at a substantially equivalent cost, our clinical trials may be delayed or we could lose potential revenue.

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.

Our research and development, manufacturing processes, clinical trials and products may involve the controlled use of hazardous materials, chemicals, viruses and various radioactive compounds. Specifically, if our products or product candidates spread from human or companion pet patients to other people or pets, these other individuals or pets (such as the immune suppressed or the very young), might be more sensitive to the product or product candidate than the patient and may experience an adverse reaction. We are subject to federal, state and local laws and regulations governing the use, manufacture, storage, handling and disposal of such materials and certain waste products, including numerous environmental, health and safety laws and regulations, such as 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 or other work-related injuries, this insurance may not provide adequate coverage against potential liabilities. 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.

Risks related to our intellectual property

If we are unable to protect our intellectual property rights or if our intellectual property rights are inadequate for our technology and product candidates, our competitive position could be harmed.

Our commercial success will depend in part on our ability to obtain and maintain patent and other intellectual property protection in the United States and other countries with respect to our proprietary technology and products. We rely on trade secret, patent, copyright and trademark laws, and confidentiality, licensing and other agreements with employees and third parties, all of which offer only limited protection. We seek to protect our proprietary position by filing and prosecuting patent applications in the United States and abroad related to our novel technologies and products that are important to our business.

The patent positions of biotechnology and pharmaceutical companies generally are highly uncertain, involve complex legal and factual questions and have in recent years been the subject of much litigation. As a result, the issuance, scope, validity, enforceability and commercial value of our patents, including those patent rights licensed to us by third parties, are highly uncertain. The steps we or our licensors have taken to protect our proprietary rights may not be adequate to preclude misappropriation of our proprietary information or infringement of our intellectual property rights, both inside and outside of the United States. Further, the examination process may require us or our licensors to narrow the claims for our pending patent applications, which may limit the scope of patent protection that may be obtained if these applications issue. The rights already granted under any of our currently issued patents or those licensed to us and those that may be granted under future issued patents may not provide us with the proprietary protection or competitive advantages we are seeking. If we or our licensors are unable to obtain and maintain patent protection for our technology and products, or if the scope of the patent protection obtained is not sufficient, our competitors could develop and commercialize technology and products similar or superior to ours, and our ability to successfully commercialize our technology and products may be adversely affected. It is also possible that we or our licensors will fail to identify patentable aspects of inventions made in the course of our development and commercialization activities before it is too late to obtain patent protection on them. It is also possible that as research and development progresses, the direction of our intellectual property strategy and patent portfolio will change, resulting in strategic business decisions to allow certain patents or patent applications to be abandoned or lapse.

With respect to patent rights, we do not know whether any of the pending patent applications for any of our compounds or biologic products will result in the issuance of patents that effectively protect our technology or products, or if any of our issued patents or if any of our or our licensors' issued patents will effectively prevent others from commercializing competitive technologies and products. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing or in some cases not at all, until they are issued as a patent. Therefore, we cannot be certain that we or our licensors were the first to make the inventions claimed in our owned or licensed patents or pending patent applications, or that we or our licensors were the first to file for patent protection of such inventions.

Our pending applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications. Because the issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability, issued patents that we own or have licensed from third parties may be challenged in the courts or patent

offices in the United States and abroad. Such challenges may result in the loss of patent protection, the narrowing of claims in such patents or the invalidity or unenforceability of such patents, which could limit our ability to stop others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection for our technology and products. Protecting against the unauthorized use of our or our licensor's patented technology, trademarks and other intellectual property rights is expensive, difficult and may in some cases not be possible. In some cases, it may be difficult or impossible to detect third-party infringement or misappropriation of our intellectual property rights, even in relation to issued patent claims, and proving any such infringement may be even more difficult.

Third-party claims of intellectual property infringement may prevent or delay our development and commercialization efforts.

Our commercial success depends in part on our avoiding infringement of the patents and proprietary rights of third parties. There is a substantial amount of litigation, both within and outside the United States, involving patent and other intellectual property rights in the biotechnology and pharmaceutical industries, including patent infringement lawsuits, interferences, oppositions and inter partes reexamination proceedings before the U.S. Patent and Trademark Office, or U.S. PTO, and corresponding foreign patent offices. Numerous U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields in which we are pursuing development candidates. As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that our product candidates may be subject to claims of infringement of the patent rights of third parties.

Third parties have asserted, and in the future may assert, that we are employing their proprietary technology without authorization. There may be third-party patents or patent applications with claims to materials, formulations, methods of manufacture or methods for treatment related to the use or manufacture of our product candidates. Because patent applications can take many years to issue, there may be currently pending patent applications which may later result in issued patents that our product candidates may infringe. In addition, third parties may obtain patents in the future and claim that use of our technologies infringes upon these patents. If any third-party patents were held by a court of competent jurisdiction to cover the manufacturing process of any of our product candidates, or any final product itself, the holders of any such patents may be able to block our ability to commercialize such product candidate unless we obtained a license under the applicable patents, or until such patents expire.

Similarly, if any third-party patents were held by a court of competent jurisdiction to cover aspects of our formulations, processes for manufacture or methods of use, including combination therapy, the holders of any such patents may be able to block our ability to develop and commercialize the applicable product candidate unless we obtained a license or until such patent expires. In either case, such a license may not be available on commercially reasonable terms or at all.

Parties making claims against us may obtain injunctive or other equitable relief, which could effectively block our ability to further develop and commercialize one or more of our product candidates. Defense of these claims, regardless of their merit, may involve substantial litigation expense and would be a substantial diversion of employee resources from our business. In the event of a successful claim of infringement against us, we may have to pay substantial damages, including treble damages and attorneys' fees for willful infringement, pay royalties, redesign our infringing products or obtain one or more licenses from third parties, which may be impossible or require substantial time and monetary expenditure.

We may not be successful in obtaining or maintaining necessary rights to gene therapy product components and processes for our development pipeline through acquisitions and in-licenses.

Presently we believe that we have rights to the intellectual property, through licenses from third parties and under patents that we own, to develop our gene therapy product candidates. Because our programs may involve additional product candidates that may require the use of proprietary rights held by third parties, the growth of our business may depend in part on our ability to acquire, in-license or use these proprietary rights. In addition, our product candidates may require specific formulations to work effectively and efficiently and these rights may be held by others. We may be unable to acquire or in-license any compositions, methods of use, processes or other third-party intellectual property rights from third parties that we identify. The licensing and acquisition of third-party intellectual property rights is a competitive area, and a number of more established companies are also pursuing strategies to license or acquire third-party intellectual property rights that we may consider attractive. These established companies may 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 assign or license rights to us. We also may be unable to license or acquire third-party intellectual property rights on terms that would allow us to make an appropriate return on our investment. If we are unable to successfully obtain rights to required third-party intellectual property rights, our business, financial condition and prospects for growth could suffer.

If we fail to comply with our obligations in the agreement under which we license intellectual property rights from the University of Southern California, or USC, or otherwise experience disruptions to our business relationships with USC or other future licensors, we could lose license rights that are important to our business.*

In October 2007, we entered into a license agreement with USC pursuant to which we received a worldwide, exclusive license to, among other things, manufacture and market products utilizing certain inventions that are critical to our business. We expect to enter into additional license agreements in the future. Our existing license agreement imposes, and we expect that future license agreements will impose, various diligence, milestone payment, royalty and other obligations on us. If we fail to comply with our obligations under these agreements, or we are subject to a bankruptcy, the licensor may have the right to terminate the license, in which event we would not be able to market products covered by the license.

We may need to obtain licenses from third parties to advance our research or allow commercialization of our product candidates, and we have done so from time to time. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, if at all. In that event, we may be required to expend significant time and resources to develop or license replacement technology. If we are unable to do so, we may be unable to develop or commercialize the affected product candidates, which could harm our business significantly. We cannot provide any assurances that third-party patents do not exist which might be enforced against our current product candidates or future products, resulting in either an injunction prohibiting our sales, or, with respect to our sales, an obligation on our part to pay royalties and/or other forms of compensation to third parties.

In certain cases, patent prosecution of our licensed technology may be controlled solely by the licensor. If our licensors fail to obtain and maintain patent or other protection for the proprietary intellectual property we license from them, we could lose our rights to the intellectual property or our exclusivity with respect to those rights, and our competitors could market competing products using the intellectual property. In certain cases, we control the prosecution of patents resulting from licensed technology. In the event we breach any of our obligations related to such prosecution, we may incur significant liability to our licensing partners. Licensing of intellectual property is of critical importance to our business and involves complex legal, business and scientific issues and is complicated by the rapid pace of scientific discovery in our industry. Disputes may arise regarding intellectual property subject to a licensing agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- the sublicensing of patent and other rights under our collaborative development relationships;
- our diligence obligations under the license agreement and what activities satisfy those diligence obligations;
- the ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our partners; and
- the priority of invention of patented technology.

If disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates.

We may be involved in lawsuits to protect or enforce our patents or the patents of our licensors, which could be expensive, time-consuming and unsuccessful.

Competitors may infringe our patents or the patents of our licensors. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time-consuming. In addition, in an infringement proceeding, a court may decide that a patent of ours or our licensors is not valid, is unenforceable and/or is not infringed, or may refuse to stop the other party from using the technology at issue on the grounds that our patents do not cover the technology in question. An adverse result in any litigation or defense proceedings could put one or more of our patents at risk of being invalidated or interpreted narrowly and could put our patent applications at risk of not issuing.

Interference proceedings provoked by third parties or brought by us may be necessary to determine the priority of inventions with respect to our patents or patent applications or those of our licensors. An unfavorable outcome could require us to cease using the related technology or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms. Our defense of litigation or interference proceedings may fail and, even if successful, may result in substantial costs and distract our management and other employees. We may not be able to prevent, alone or with our licensors, misappropriation of our intellectual property rights, particularly in countries where the laws may not protect those rights as fully as in the United States.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our common stock.

Obtaining and maintaining our patent protection depends on compliance with various procedural, document submission, fee payment and other requirements imposed by governmental patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.

Periodic maintenance fees, renewal fees, annuity fees and various other governmental fees on patents and/or applications will be due to be paid to the U.S. PTO and various governmental patent agencies outside of the United States in several stages over the lifetime of the patents and/or applications. We employ an outside firm and rely on our outside counsel to pay these fees due to non-U.S. patent agencies. The U.S. PTO and various non-U.S. governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. We employ reputable law firms and other professionals to help us comply, and in many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which non-compliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, our competitors might be able to enter the market and this circumstance would have a material adverse effect on our business.

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

If we, USC or one of our future licensing partners initiated legal proceedings against a third party to enforce a patent covering one of our product candidates, the defendant could counterclaim that the patent covering our product candidate 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, including 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 U.S. PTO, or made a misleading statement, during prosecution. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. Such mechanisms include re-examination, post grant review and equivalent proceedings in foreign jurisdictions (e.g., opposition proceedings). Such proceedings could result in revocation or amendment to our patents in such a way that they no longer cover our product candidates. The outcome following legal assertions of invalidity and unenforceability is unpredictable. With respect to the validity question, for example, we cannot be certain 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 our product candidates. Such a loss of patent protection would have a material adverse impact on our business.

We may be subject to claims that our employees, consultants or independent contractors have wrongfully used or disclosed confidential information of third parties or that our employees have wrongfully used or disclosed alleged trade secrets of their former employers.

We employ individuals who were previously employed at universities or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees, consultants and independent contractors do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees, consultants or independent contractors have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of any of our employee's former employer or other third parties. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel, which could adversely impact our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

We may be subject to claims challenging the inventorship or ownership of our patents and other intellectual property.

We may be subject to claims that former employees, collaborators or other third parties have an ownership interest in our patents or other intellectual property. We may have potential ownership disputes arising, for example, from conflicting obligations of consultants, collaborators or others who are involved in developing our product candidates. Litigation may be necessary to defend against these and other claims challenging inventorship or ownership. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, valuable intellectual property. Such an outcome could have a material adverse effect on our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

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 biotechnology companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biotechnology industry involve both technological and legal complexity, and therefore obtaining and enforcing biotechnology patents is costly, time-consuming and inherently uncertain. In addition, the United States has recently enacted and is currently implementing wide-ranging patent reform legislation. Recent U.S. Supreme Court rulings have narrowed the scope of patent protection available in certain circumstances and weakened 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 U.S. 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.

We have not yet registered trademarks for a commercial trade name for Toca 511 & Toca FC, and failure to secure such registrations could adversely affect our business.

We have not yet developed a proprietary name for our products nor registered trademarks for a commercial trade name for Toca 511 & Toca FC. During trademark registration proceedings, we may receive rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in the U.S. PTO and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings. Moreover, any name we propose to use with our product candidates in the United States must be approved by the FDA, regardless of whether we have registered it, or applied to register it, as a trademark. The FDA typically conducts a review of proposed product names, including an evaluation of potential for confusion with other product names. If the FDA objects to any of our proposed proprietary product names, we may be required to expend significant additional resources in an effort to identify a suitable substitute name that would qualify under applicable trademark laws, not infringe the existing rights of third parties and be acceptable to the FDA.

We may not be able to protect our intellectual property rights throughout the world.

Filing, prosecuting and defending patents on product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the United States. Consequently, we may not be able to prevent third parties from practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and further, may export otherwise infringing products to territories where we have patent protection, but enforcement is not as strong as that in the United States. These products may compete with our products and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents, trade secrets and other intellectual property protection, particularly those relating to biotechnology products, which could make it difficult for us to stop the infringement of our patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

Risks related to ownership of our common stock

The market price of our common stock may be highly volatile, and you could lose all or part of your investment.*

The market price of our common stock is likely to be volatile. Our stock price could be subject to wide fluctuations in response to a variety of factors, including the following:

- adverse results or delays in preclinical or clinical trials;
- reports of adverse events in other gene therapy products or clinical trials of such products;

- inability to obtain additional funding;
- any delay in filing an IND or BLA for any of our product candidates and any adverse development or perceived adverse development with respect to the FDA's review of that IND or BLA;
- failure to develop successfully and commercialize our product candidates;
- failure to maintain our existing strategic collaboration or enter into new collaborations;
- failure by us or our licensors and strategic collaboration partners to prosecute, maintain or enforce our intellectual property rights;
- changes in laws or regulations applicable to future products;
- inability to obtain adequate product supply for our product candidates or the inability to do so at acceptable prices;
- adverse regulatory decisions;
- introduction of new products, services or technologies by our competitors;
- failure to meet or exceed financial projections we may provide to the public;
- failure to meet or exceed the financial projections of the investment community;
- the perception of the pharmaceutical industry by the public, legislatures, regulators and the investment community;
- announcements of significant acquisitions, strategic partnerships, joint ventures or capital commitments by us, our strategic collaboration partners or our competitors;
- disputes or other developments relating to proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our technologies;
- additions or departures of key scientific or management personnel;
- significant lawsuits, including patent or stockholder litigation;
- changes in the market valuations of similar companies;
- sales of our common stock by us or our stockholders in the future; and
- trading volume of our common stock.

In addition, companies trading in the stock market in general, and The Nasdaq Global Select Market in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance.

Unstable market and economic conditions may have serious adverse consequences on our business, financial condition and stock price.

As widely reported, global credit and financial markets have experienced extreme volatility and disruptions in the past several years, including severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates and uncertainty about economic stability. We cannot assure you that further deterioration in credit and financial markets and confidence in economic conditions will not occur. Our general business strategy may be adversely affected by any such economic downturn, volatile business environment or continued unpredictable and unstable market conditions. If the current equity and credit markets deteriorate, or do not improve, it may make any necessary debt or equity financing more difficult, more costly and more dilutive. Failure to secure any necessary financing in a timely manner and on favorable terms could have a material adverse effect on our growth strategy, financial performance and stock price and could require us to delay or abandon clinical development plans. In addition, there is a risk that one or more of our current service providers, manufacturers and other partners may not survive these difficult economic times, which could directly affect our ability to attain our operating goals on schedule and on budget.

We do not intend to pay dividends on our common stock so any returns will be limited to the value of our stock.*

We have never declared or paid any cash dividends on our common stock. We currently anticipate that we will retain future earnings for the development, operation and expansion of our business and do not anticipate declaring or paying any cash dividends

for the foreseeable future, including due to limitations that are currently imposed by our loan and security agreement. Any return to stockholders will therefore be limited to the appreciation of their stock.

We are an emerging growth company, and we cannot be certain if the reduced reporting requirements applicable to emerging growth companies will make our common stock less attractive to investors.*

We are an emerging growth company, as defined in the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended, or the Sarbanes-Oxley Act, reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements and exemptions from the requirements of holding nonbinding advisory votes on executive compensation and stockholder approval of any golden parachute payments not previously approved. We could be an emerging growth company for up to five years following the year in which we completed our initial public offering, although circumstances could cause us to lose that status earlier. We will remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) following the fifth anniversary of the completion of our initial public offering, (b) in which we have total annual gross revenue of at least $1 billion or (c) in which we are deemed to be a large accelerated filer, which requires the market value of our common stock that is held by non-affiliates to exceed $700 million as of the prior June 30th, and (2) the date on which we have issued more than $1 billion in non-convertible debt during the prior three-year period.

Even after we no longer qualify as an emerging growth company, we may still qualify as a "smaller reporting company" which would allow us to take advantage of many of the same exemptions from disclosure requirements including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements. We cannot predict if investors will find our common stock less attractive because we may rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies. As a result, changes in rules of U.S. generally accepted accounting principles or their interpretation, the adoption of new guidance or the application of existing guidance to changes in our business could significantly affect our financial position and results of operations.

We will incur significant increased costs as a result of operating as a public company, and our management will be required to devote substantial time to existing and new compliance initiatives.*

As a public company, we will incur significant legal, accounting and other expenses that we did not incur as a private company. We are subject to the reporting requirements of the Exchange Act which require, among other things, that we file with the SEC annual, quarterly and current reports with respect to our business and financial condition. In addition, the Sarbanes-Oxley Act, as well as rules subsequently adopted by the SEC and The NASDAQ Global Select Market to implement provisions of the Sarbanes-Oxley Act, impose significant requirements on public companies, including requiring establishment and maintenance of effective disclosure and financial controls and changes in corporate governance practices. Further, in July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive compensation related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas such as "say on pay" and proxy access. Recent legislation permits emerging growth companies to implement many of these requirements over a longer period and up to five years from the pricing of our initial public offering. We intend to take advantage of this new legislation but cannot guarantee that we will not be required to implement these requirements sooner than budgeted or planned and thereby incur unexpected expenses. Stockholder activism, the current political environment and the current high level of government intervention and regulatory reform may lead to substantial new regulations and disclosure obligations, which may lead to additional compliance costs and impact the manner in which we operate our business in ways we cannot currently anticipate.

We expect the rules and regulations applicable to public companies to substantially increase our legal and financial compliance costs and to make some activities more time-consuming and costly. If these requirements divert the attention of our management and personnel from other business concerns, they could have a material adverse effect on our business, financial condition and results of operations. The increased costs will decrease our net income or increase our net loss, and may require us to reduce costs in other areas of our business or increase the prices of our products or services. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance and we may be required to incur substantial costs to maintain the same or similar coverage. We cannot predict or estimate the amount or timing of additional costs we may incur to

respond to these requirements. The impact of these requirements could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, our board committees or as executive officers.

Sales of a substantial number of shares of our common stock in the public market could cause our stock price to fall.*

If our existing stockholders sell, or indicate an intention to sell, substantial amounts of our common stock in the public market, the market price of our common stock could decline. We have 19,809,449 shares of common stock outstanding as of November 6, 2017. We are unable to predict the effect that sales may have on the prevailing market price of our common stock.

Sales of our common stock by current stockholders may make it more difficult for us to sell equity or equity-related securities in the future at a time and price that we deem reasonable or appropriate, and make it more difficult for you to sell shares of our common stock. In addition, as of September 30, 2017, 3,136,322 shares of common stock that are either subject to outstanding options, reserved for future issuance under our equity incentive plans or subject to outstanding warrants will become eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules and Rule 144 and Rule 701 under the Securities Act. If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the market price of our common stock could decline.

Future sales and issuances of our common stock or rights to purchase common stock, including pursuant to our equity incentive plans, could result in additional dilution of the percentage ownership of our stockholders and could cause our stock price to fall.*

Additional capital will be needed in the future to continue our planned operations. To the extent we raise additional capital by issuing equity securities, our stockholders may experience substantial dilution. We may sell common stock, convertible securities or other equity securities in one or more transactions at prices and in a manner we determine from time to time. If we sell common stock, convertible securities or other equity securities in more than one transaction, investors may be materially diluted by subsequent sales. These sales may also result in material dilution to our existing stockholders, and new investors could gain rights superior to our existing stockholders.

Pursuant to our 2017 Equity Incentive Plan, or 2017 Plan, our management is authorized to grant stock options to our employees, directors and consultants. The aggregate number of shares of our common stock that may be issued pursuant to stock awards under our 2017 Plan is up to 3,125,662 shares. The number of shares of our common stock reserved for issuance under our 2017 Plan will automatically increase on January 1 of each year, beginning on January 1, 2018 and continuing through and including January 1, 2027, by 4% of the total number of shares of our capital stock outstanding on December 31 of the preceding calendar year, or a lesser number of shares determined by our board of directors. Additionally, the number of shares of our common stock reserved for issuance under our 2017 Employee Stock Purchase Plan, or the ESPP, will automatically increase on January 1 of each year, beginning on January 1, 2018 and continuing through and including January 1, 2027, by the lesser of 1% of the total number of shares of our capital stock outstanding on December 31 of the preceding calendar year, 300,000 shares or a lesser number of shares determined by our board of directors. Unless our board of directors elects not to increase the number of shares available for future grant each year under the 2017 Plan and the ESPP, our stockholders may experience additional dilution, which could cause our stock price to fall.

In addition, as of September 30, 2017, options to purchase 2,636,060 shares of our common stock at a weighted-average exercise price of $13.31 per share were outstanding. The exercise of any of these options would result in additional dilution.

We have broad discretion in the use of working capital and may not use it effectively.*

Our management will have broad discretion in the application of working capital, and you will not have the opportunity as part of your investment decision to assess whether working capital is being used appropriately. Because of the number and variability of factors that will determine our use of our working capital, its ultimate use may vary substantially from its currently intended use. Our management might not apply our working capital in ways that ultimately increase the value of your investment. We intend to use our working capital to fund our Phase 3 clinical trial of Toca 511 & Toca FC in recurrent HGG, manufacturing scale-up and validation for Toca 511 & Toca FC, the other ongoing and planned clinical development activities for Toca 511 & Toca FC and for working capital and other general corporate purposes. The failure by our management to apply this working capital effectively could harm our business. Pending its use, we may invest our working capital in short-term, investment-grade, interest-bearing securities. These investments may not yield a favorable return to our stockholders. If we do not invest or apply our working capital in ways that enhance stockholder value, we may fail to achieve expected financial results, which could cause our stock price to decline.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.*

Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, or the Code, if a corporation undergoes an "ownership change," generally defined as a cumulative change in its equity ownership by "5-percent shareholders" of greater than 50 percentage points (by value) over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards, or NOLs, and certain other pre-change tax attributes (such as research tax credits) to offset its post-change taxable income and taxes, as applicable, may be limited. We have completed an initial public offering and multiple rounds of financing since our inception which may have resulted in an ownership change or could result in an ownership change in the future. As of September 30, 2017, we have not completed a Section 382 and 383 analysis regarding any limitations on our NOLs and research and development credit carryforwards and such limitations could be significant. We may also experience ownership changes in the future as a result of subsequent shifts in our stock ownership. As a result, our ability to use our NOLs and research and development credit carryforwards to offset our U.S. federal taxable income and taxes, as applicable, may be subject to limitations, which could potentially result in increased future tax liability to us. In addition, at the state level, similar rules may apply and there may be periods during which the use of NOLs is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed.

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 will depend in part on the research and reports that securities or industry analysts publish about us or our business. If one or more of the analysts who covers us downgrades our stock or publishes inaccurate or unfavorable research about our business, our stock price may decline. If one or more of these analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our stock could decrease, which might cause our stock price and trading volume to decline.

Provisions in our amended and restated certificate of incorporation and amended and restated bylaws, as well as provisions of Delaware law, could make it more difficult for a third party to acquire us or increase the cost of acquiring us, even if doing so would benefit our stockholders or remove our current management.*

Our amended and restated certificate of incorporation, amended and restated bylaws and Delaware law contain provisions that may have the effect of delaying or preventing a change in control of us or changes in our management. Our amended and restated certificate of incorporation and amended and restated bylaws, include provisions that:

- permit our board of directors to issue up to 10,000,000 shares of preferred stock, with any rights, preferences and privileges as they may designate (including the right to approve an acquisition or other change in our control);
- provide that the authorized number of directors may be changed only by resolution of the board of directors;
- provide that the board of directors or any individual director may only be removed with cause and the affirmative vote of the holders of at least 66-2/3% of the voting power of all of our then outstanding common stock;
- provide that all vacancies, including newly created directorships, may, except as otherwise required by law, be filled by the affirmative vote of a majority of directors then in office, even if less than a quorum;
- divide our board of directors into three classes;
- require that any action to be taken by our stockholders must be effected at a duly called annual or special meeting of stockholders and not be taken by written consent;
- provide that stockholders seeking to present proposals before a meeting of stockholders or to nominate candidates for election as directors at a meeting of stockholders must provide notice in writing in a timely manner and also specify requirements as to the form and content of a stockholder's notice;
- do not provide for cumulative voting rights (therefore allowing the holders of a majority of the shares of common stock entitled to vote in any election of directors to elect all of the directors standing for election, if they should so choose);
- provide that special meetings of our stockholders may be called only by the chairman of the board, our Chief Executive Officer or by the board of directors pursuant to a resolution adopted by a majority of the total number of authorized directors; and
- provide that the Court of Chancery of the State of Delaware will be the sole and exclusive forum for (i) any derivative action or proceeding brought on our behalf, (ii) any action asserting a claim of breach of a fiduciary duty owed by any of our directors or officers to us or our stockholders, (iii) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law or our certificate of incorporation or bylaws, or (iv) any action asserting a claim against us governed by the internal affairs doctrine.

These provisions, alone or together, could delay or prevent hostile takeovers and changes in control or changes in our management.

In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us.

Any provision of our amended and restated certificate of incorporation or amended and restated bylaws or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

Our amended and restated certificate of incorporation and amended and restated bylaws provide that the Court of Chancery of the State of Delaware is the sole and exclusive forum for substantially all disputes between us and our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or employees.*

Our amended and restated certificate of incorporation and amended and restated bylaws provide that the Court of Chancery of the State of Delaware is the sole and exclusive forum for (i) any derivative action or proceeding brought on our behalf; (ii) any action asserting a breach of fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders; (iii) any action asserting a claim against us or any of our directors, officers or other employees arising pursuant to the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated bylaws; or (iv) any action asserting a claim against us or any of our directors, officers or other employees that is governed by the internal affairs doctrine. The choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and other employees. Alternatively, if a court were to find the choice of forum provision contained in our amended and restated certificate of incorporation and amended and restated bylaws to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could adversely affect our business and financial condition.

Because we have an even number of members of our board of directors, deadlocks may occur in our board of directors' decision-making process, which may delay or prevent critical decisions from being made.*

Since we have an even number of directors, deadlocks may occur when such directors disagree on a particular decision or course of action. Our amended and restated certificate of incorporation and amended and restated bylaws do not contain any mechanisms for resolving potential deadlocks. While our directors are under a duty to act in the best interest of our company, any deadlocks may impede the further development of our business in that such deadlocks may delay or prevent critical decisions regarding our business.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds.

Use of Proceeds

On April 12, 2017, our Registration Statement on Form S-1 (file No. 333-216574) was declared effective by the SEC for our initial public offering of common stock. We issued 9,775,000 shares of common stock at an offering price of $10.00 per share for gross proceeds of $97.8 million. After deducting underwriting discounts, commissions and offering costs incurred by us of $10.8 million, the net proceeds from the offering were $86.9 million. The offering was completed on April 19, 2017. The joint bookrunning managers for the offering were Leerink Partners LLC, Evercore Group L.L.C. and Stifel, Nicolaus & Company, Incorporated. No offering costs were paid or are payable, directly or indirectly, to our directors or officers, to persons owning 10% or more of any class of our equity securities, or to any of our affiliates.

There has been no material change in the expected use of the net proceeds from our initial public offering as described in our final prospectus filed with the SEC on April 13, 2017. Through the date hereof, we have not used any of the net proceeds from the offering. Pending their use, we plan to invest the net proceeds from this offering in investment grade instruments that are backed by the U.S. government.

Item 6. Exhibits

The following exhibits are filed as part of this Quarterly Report on Form 10-Q.

Exhibit Number	Description of Exhibit
3.1	Amended and Restated Certificate of Incorporation of the Registrant, incorporated by reference to Exhibit 3.1 of the Registrant's Current Report on Form 8-K filed on April 19, 2017.
3.2	Amended and Restated Bylaws of the Registrant, incorporated by reference to Exhibit 3.2 of the Registrant's Current Report on Form 8-K filed on April 19, 2017.
4.1	Form of Common Stock Certificate of the Registrant, incorporated by reference to Exhibit 4.1 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed with the Securities and Exchange Commission on March 9, 2017.
4.2	Warrant to Purchase Common Stock, dated June 5, 2013, issued to Voices Against Brain Cancer, incorporated by reference to Exhibit 4.2 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed with the Securities and Exchange Commission on March 9, 2017.
4.3	Research and Development Grant Agreement, dated June 5, 2013, by and between the Registrant and Voices Against Brain Cancer, incorporated by reference to Exhibit 4.3 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed with the Securities and Exchange Commission on March 9, 2017.
4.4	Warrant to Purchase Stock, dated October 30, 2015, issued to Oxford Finance LLC, incorporated by reference to Exhibit 4.4 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed with the Securities and Exchange Commission on March 9, 2017.
4.5	Warrant to Purchase Stock, dated October 30, 2015, issued to Silicon Valley Bank, incorporated by reference to Exhibit 4.5 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed with the Securities and Exchange Commission on March 9, 2017.
31.1	Certification of Principal Executive Officer pursuant to Rule13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act, as amended.*
31.2	Certification of Principal Financial Officer pursuant to Rule13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act, as amended.*
32.1	Certification of Principal Executive Officer and Principal Financial Officer pursuant to Rule 13a-14(b) or 15d-14(b) of the Securities Exchange Act, as amended, and 18 U.S.C. Section 1350.*
101.INS	XBRL Instance Document.
101.SCH	XBRL Taxonomy Extension Schema Document.
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.

* Filed herewith.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

Date: November 8, 2017

TOCAGEN INC.

By: /s/ Martin J. Duvall
Martin J. Duvall
Chief Executive Officer
(Principal Executive Officer)

By: /s/ Mark Foletta
Mark Foletta
Chief Financial Officer
(Principal Financial Officer)

Exhibit 31.1

CERTIFICATION

I, Martin J. Duvall, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Tocagen Inc., a Delaware corporation (the "registrant");

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a–15(e) and 15d–15(e)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(c) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 8, 2017

/s/ Martin J. Duvall

Martin J. Duvall
Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION

I, Mark Foletta, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Tocagen Inc., a Delaware corporation (the "registrant");

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a–15(e) and 15d–15(e)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(c) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 8, 2017

/s/ Mark Foletta

Mark Foletta
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

SECTION 1350 CERTIFICATION

Each of the undersigned, Martin J. Duvall, Chief Executive Officer of Tocagen Inc., a Delaware corporation (the "Company"), and Mark Foletta, Chief Financial Officer of the Company, do hereby certify, pursuant to 18 U.S.C. Section 1350 as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of his knowledge (1) the quarterly report on Form 10-Q of the Company for the quarterly period ended September 30, 2017, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, and (2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ Martin J. Duvall
Name: Martin J. Duvall
Title: Chief Executive Officer (Principal Executive Officer)
Dated: November 8, 2017

/s/ Mark Foletta
Name: Mark Foletta
Title: Chief Financial Officer (Principal Financial Officer)
Dated: November 8, 2017

This certification accompanies and is being "furnished" with this Report, shall not be deemed "filed" by the Company for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or otherwise subject to liability under that Section and shall not be deemed to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, whether made before or after the date of this Report, irrespective of any general incorporation language contained in such filing. A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.