UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

(Mark One)

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

For the fiscal year ended December 31, 2019

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 No.)**
4242 Campus Point Court, Suite 600 San Diego, CA	**92121**
(Address of principal executive offices)	**(Zip Code)**

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

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, par value $0.001 per share	TOCA	The Nasdaq Global Select Market

Securities registered pursuant to 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. YES ☐ NO ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. YES ☐ NO ☒

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 every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit 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	☐	Smaller reporting company	☒
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 ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant as of June 30, 2019 (the last business day of the registrant's most recently completed second fiscal quarter) was approximately $223 million based on the closing price of the registrant's common stock on June 30, 2019 of $9.34 per share, as reported by the Nasdaq Global Select Market.

As of February 21, 2020, there were 23,899,261 shares of the registrant's common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive proxy statement to be filed with the Securities and Exchange Commission, or SEC, subsequent to the date hereof pursuant to Regulation 14A in connection with the registrant's 2019 Annual Meeting of Stockholders, are incorporated by reference into Part III of this Annual Report on Form 10-K. Such proxy statement will be filed with the SEC not later than 120 days after the conclusion of the registrant's fiscal year ended December 31, 2019.

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements. The forward-looking statements are contained principally in the sections entitled “Risk Factors,” “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and “Business.” These statements relate to future events or to our future financial performance and involve known and unknown risks, uncertainties and other factors which may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Forward-looking statements include, but are not limited to, statements about:

- our ability to satisfy the required conditions and otherwise complete our planned merger with Forte Biosciences, Inc., or Forte, or the Merger, pursuant to the Agreement and Plan of Merger and Reorganization, dated February 19, 2020, or the Merger Agreement, by and among Tocagen, Telluride Merger Sub, Inc., a wholly-owned subsidiary of Tocagen, and Forte, on a timely basis or at all;
- the expected benefits and potential value created by the proposed Merger for our stockholders, including the ownership percentage of our stockholders in the combined organization immediately following the consummation of the proposed Merger;
- our ability to establish and maintain potential new collaborative, partnering or other strategic arrangements for our programs, including a sale or other divestiture of our program assets;
- our ability to monetize our program assets to support the ownership percentage of our stockholders in the proposed Merger;
- our projected operating and financial performance;
- our estimates regarding the sufficiency of our cash resources, expenses, including those related to the consummation of the proposed Merger, capital requirements and needs for additional financing, and our ability to obtain additional financing and to continue as a going concern if the Merger is not completed; and
- our ability to protect our intellectual property and operate our business without infringing upon the intellectual property rights of others.

In some cases, you can identify these statements by terms such as “anticipate,” “believe,” “could,” “estimate,” “expects,” “intend,” “may,” “plan,” “potential,” “predict,” “project,” “should,” “will,” “would” or the negative of those terms, and similar expressions that convey uncertainty of future events or outcomes. These forward-looking statements reflect our management’s beliefs, opinions and views with respect to future events and are based on estimates, assumptions and information available to us as of the date of this Annual Report on Form 10-K, and while we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete and our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain and are subject to risks and uncertainties. We discuss many of these risks in greater detail under the heading “Risk Factors.” Moreover, we operate in a very competitive and rapidly changing environment. New risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. Given these uncertainties, you should not place undue reliance on these forward-looking statements.

You should carefully read this Annual Report on Form 10-K and the documents that we reference herein and have filed as exhibits to the Annual Report on Form 10-K completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of the forward-looking statements in this Annual Report on Form 10-K by these cautionary statements.

Except as required by law, we assume no obligation to update these forward-looking statements publicly, or to update the reasons actual results could differ materially from those anticipated in any forward-looking statements, whether as a result of new information, future events or otherwise.

PART I

Item 1. Business.

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. 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. Our founding vision is "No One Should Die Of Cancer" because we believe the immune system can be safely activated to fight the patient's cancer.

We had been developing our lead product candidate, Toca 511 (vocimagene amiretrorepvec) & Toca FC (extended-release flucytosine), for the treatment of recurrent high grade glioma, or HGG, a brain cancer with limited treatment options, low survival rates and, therefore, a significant unmet medical need. We conducted a randomized, controlled Phase 3 clinical trial (Toca 5) of Toca 511 & Toca FC in patients with recurrent HGG, which was designed to serve as a registrational trial. At the final analysis, the trial missed the primary endpoint of overall survival compared to the standard of care treatment (11.1 months median compared to 12.2 months, HR=1.06, p=0.6154). In addition, all secondary endpoints showed no meaningful difference between the arms of the trial. We have discontinued further development of Toca 511 & Toca FC.

To conserve our cash resources, we have substantially reduced our workforce and have wound down and suspended our research and development activities. We are continuing to provide study drug for patients who remain on therapy via investigator sponsored trials (principal investigator assumes responsibility) through single patient INDs and are continuing our day-to-day business operations including the limited remaining activities required to wrap up the Toca 5 trial.

Following the announcement of the Toca 5 trial results, our board of directors commenced a process of evaluating strategic alternatives to maximize stockholder value. To assist with this process, our board of directors engaged a financial advisory firm to help explore our available strategic alternatives, including possible mergers and business combinations, a sale of part or all of our assets, and collaboration and licensing arrangements. On February 19, 2020, we and Forte announced the signing of the Merger Agreement. Upon the terms and subject to the satisfaction of the conditions described in the Merger Agreement, including approval of the transaction by our stockholders, a wholly owned subsidiary of Tocagen will be merged with and into Forte, with Forte surviving the Merger as a wholly-owned subsidiary of Tocagen.

The proposed Merger is structured as a stock-for-stock transaction whereby all of Forte's outstanding shares of common stock and securities convertible into or exercisable for Forte's common stock will be converted into the right to receive Tocagen common stock and securities convertible into or exercisable for Tocagen common stock. Under the exchange ratio formula in the Merger Agreement, the former Forte equityholders immediately before the Merger are expected to own approximately 74.5% of the outstanding capital stock of Tocagen (without giving effect to the anticipated concurrent financing), and the equityholders of Tocagen immediately before the Merger are expected to own approximately 25.5% of the outstanding capital stock of Tocagen, on a fully diluted basis using the treasury stock method subject to certain assumptions. We anticipate that the Merger will close in the second quarter of 2020. This transaction, which has been approved by our board of directors and the board of directors of Forte, is subject to the satisfaction or waiver of certain conditions, including the required approvals by the parties' stockholders and other customary closing conditions. Certain affiliates of ours who hold approximately 6% of our common stock as of date of the Merger Agreement have agreed to vote in favor of the Merger and certain affiliates of Forte, who hold approximately 95% of the outstanding capital stock of Forte as of date of the Merger Agreement have agreed to vote in favor of the Merger.

Although we have entered into the Merger Agreement and intend to consummate the proposed Merger, there is no assurance that we will be able to successfully consummate the proposed Merger on a timely basis, or at all. If, for any reason, the proposed Merger is not completed, we will reconsider our strategic alternatives and could pursue one or more of the following courses of action:

- ***Pursue potential collaborative, partnering or other strategic arrangements for our assets, including a sale or other divestiture of our assets.*** We have discontinued further development of our programs, including Toca 511 & Toca FC, and do not currently have any plans to resume development of any of our development programs. We continue our efforts to seek potential collaborative, partnering or other strategic arrangements for our programs, including a sale or other divestiture of our assets which could allow our technology to continue being developed.
- ***Pursue another strategic transaction like the proposed Merger.*** Our board of directors may elect to pursue an alternative strategy, one of which may be a strategic transaction similar to the proposed Merger.
- ***Dissolve and liquidate our assets.*** If, for any reason, the proposed Merger is not consummated and we are unable to identify and complete an alternative strategic transaction like the Merger or potential collaborative, partnering or other strategic arrangements for our assets, or to continue to operate our business due to our inability to raise additional funding, we may be required to dissolve and liquidate our assets. In such case, we would be required to pay all of our debts and contractual obligations, and to set aside certain reserves for potential future claims, and there can be no assurances as to the amount or timing of available cash left to distribute to our stockholders after paying our debts and other obligations and setting aside funds for reserves.

Our Proprietary Technology Platform: Harnessing Cancer Immunotherapy and Gene Therapy Together to Fight Cancer

We believe our investigational gene therapy platform and therapeutic genes represent innovative and differentiated approaches in cancer-selective immunotherapy which have the potential to drive a safe, powerful and durable immune response against cancer, without triggering autoimmunity. We chose to utilize RRVs as the basis of our gene therapy platform for cancer-selective immunotherapy because they exhibit several characteristics that we believe allow us to optimize the safety, delivery and persistence of our therapeutic genes in cancer cells. These characteristics include that they:

- replicate readily and persist in the immune-defective environment of cancer;
- are controlled in healthy tissue by normal immune mechanisms;
- only infect dividing cells such as cancer cells;
- bud from, rather than lyse, infected cancer cells, reducing anti-RRV immune activation;
- infect most cancer types; and
- can cross the blood tumor barrier.

Manufacturing

Toca 511 & Toca FC, consists of a biological component and a drug component, which are separately manufactured and are both covered by our proprietary intellectual property. The process for Toca 511 manufacturing and testing has been developed internally and we believe that the process itself and the expertise to design and implement this process as well as the testing are significant assets. The process and the vector composition are covered by patents, patent applications and trade secrets. The process for Toca FC (extended release 5-FC) was also designed internally. We have relied on third-party contract manufacturing organizations, or CMOs, for both of these manufacturing processes to produce our final product for clinical use, as we do not own or operate manufacturing facilities.

We currently have no plans to build our own manufacturing capacity to manufacture Toca 511 or Toca FC.

License and Collaboration Agreements

License Agreement with ApolloBio

In April 2018, we entered into a license agreement with ApolloBio, or the ApolloBio License Agreement, which became effective in July 2018, pursuant to which we granted ApolloBio an exclusive license to develop and commercialize Toca 511 & Toca FC within the greater China region, including mainland China, Hong Kong, Macao and Taiwan, or the Licensed Territory.

Under the ApolloBio License Agreement, in addition to an aggregate upfront payment of $16.0 million, we are eligible to receive up to an aggregate $111.0 million, less withholding and other taxes, upon the achievement of specified development and commercial milestones. We are also eligible for low double-digit tiered royalty payments based on annual net sales of licensed products in the Licensed Territory, subject to reduction under specified circumstances. ApolloBio will be responsible for all development and commercialization costs in the Licensed Territory. Future payments by ApolloBio are subject to the People's Republic of China, or PRC currency exchange approval and may be subject to other approvals by PRC authorities.

Under the ApolloBio License Agreement, we have received net proceeds of $15.2 million which was comprised of a $16.0 million up-front payment and a $2.0 million milestone payment less $1.7 million in foreign income taxes and $1.1 million in certain foreign non-income taxes.

Unless earlier terminated, the ApolloBio License Agreement will expire upon the expiration of the last-to-expire royalty term for any and all licensed products, which royalty term is, with respect to a licensed product in a particular region (*i.e.*, mainland China, Hong Kong, Macao and Taiwan) of the Licensed Territory, or each, a Region, the latest of (i) 10 years after the first commercial sale of such licensed product in such Region, (ii) the expiration of all regulatory exclusivity as to such licensed product in such Region and (iii) the date of expiration of the last valid patent claim covering such licensed product in such Region. Either party may terminate the ApolloBio License Agreement upon a material breach by the other party that remains uncured following 60 days (or, with respect to any payment breach, 10 days) after the date of written notice of such breach. ApolloBio may terminate the ApolloBio License Agreement at any time by providing 90 days' prior written notice to us. In addition, we may terminate the ApolloBio License Agreement upon written notice to ApolloBio under specified circumstances if ApolloBio challenges the licensed patent rights.

Laboratory Services and License Agreement with Siemens

In November 2011, we entered into a laboratory services and license agreement with Siemens Healthcare Diagnostics Inc., or Siemens, which we amended in June 2015, pursuant to which we agreed to engage Siemens (i) to develop and perform certain *in vitro* diagnostic assays in connection with the cancer therapy trials of Toca 511 & Toca FC, (ii) concurrently and/or thereafter, to further develop, obtain FDA approval for, and perform one or more of such *in vitro* diagnostic assays as drug monitoring diagnostics for Toca 511 & Toca FC as Toca 511 & Toca FC receives marketing approval from the FDA, and (iii) following FDA approval of such *in vitro* diagnostic assay as a monitoring diagnostic, to perform such *in vitro* diagnostic monitoring assays as necessary in connection with post-marketing clinical trials of Toca 511 & Toca FC and, if appropriate, as commercial diagnostic tests. We granted Siemens the licensed intellectual property covered by the agreement on an exclusive and non-exclusive basis, depending on Siemens' use of such intellectual property.

Under the terms of the agreement, Siemens paid us an initial upfront payment of $0.5 million. Additionally, beginning with the first commercial sale of a product that has received approval for clinical use under the agreement, Siemens will pay us a royalty in the 10-20 percent range of net assay revenue with respect to approved designated assay products and net sales revenue with respect to approved *in vitro* diagnostic products, until the fifth anniversary of such commercial sale, subject to certain reductions. Beginning with the first commercial sale of Toca 511 or Toca FC, we will pay a royalty to Siemens in the low single-digit percentage range on net product sales of Toca 511 & Toca FC for sales up to the mid-nine-digit dollar range per year, until the fifth anniversary of such commercial sale.

The term of this agreement will continue until the expiration of all payment obligations. The agreement provides that it may be terminated by either party upon written notice to the other party in the event of the other party's material breach of the agreement if such breach remains uncured for 45 days, or in the event the other party files a voluntary petition in bankruptcy, is adjudicated as bankrupt or insolvent after all appeals are exhausted, makes a general assignment for the benefit of creditors or fails to discharge or have dismissed within 60 days an involuntary petition in bankruptcy filed against it. If market approval is rejected by the FDA, Siemens must provide us with prompt written notice. Should the parties be unable to reach mutual agreement regarding regulatory strategy within 20 business days of such notice, then either party may terminate the agreement upon written notice to the other party. Siemens may terminate the agreement for any reason upon 90 days prior written notice to us, provided that, notwithstanding such termination, Siemens must continue to provide the laboratory services for any of our trials the protocol for which has been submitted to FDA until the conclusion of such pre-approval trial. Siemens may also terminate the agreement if, after using commercially reasonable efforts, certain assay specifications are not achieved. If Siemens terminates the agreement for breach of contract by us, the licenses granted to Siemens will survive such termination and will become non-exclusive, perpetual and irrevocable, provided that Siemens will have the right to terminate any such license at any time upon written notice to us. If the agreement expires, or if the agreement is terminated by us for breach of contract by Siemens or for failure to reach an agreement on regulatory strategy, the restriction in the license granted to activities outside of the territory will terminate, and we will have the right to pursue development and commercialization of companion diagnostics for products with one or more other partners in the territory, and to grant to such other partners sublicenses of our rights under the agreement. If the agreement is terminated by either party for failure to reach an agreement on regulatory strategy, or by Siemens by 90 days written notice, for a minimum of 45 days after the later of (i) the termination date or (ii) completion of any required post-termination laboratory services and delivery to us of all results thereof, Siemens must retain any stocks of qualified reagents for the assays that remain as of Siemens' completion of such laboratory services, and, upon our request made at any time during such 45-day period, Siemens must deliver such remaining stocks to us, provided that we shall have executed documentation reasonably satisfactory to Siemens acknowledging that the use of such reagents is restricted to investigational use pursuant to our investigational new drug application, or IND, and any other use permitted by, and in compliance with, applicable laws, regulatory guidelines and regulatory approvals.

License Agreement with USC

In October 2007, we entered into a license agreement with the University of Southern California, or USC, pursuant to which we received a worldwide, exclusive license to, among other things, manufacture and market products utilizing inventions related to our RRV platform and other key technology.

Under the terms of the agreement, we paid an initial license fee to USC in the low six-digit dollar range and issued to USC shares of our common stock in an amount equal to the low single-digit percent range of all the number of shares of common stock issued at the time shares were issued to our six founders prior to the date of the agreement. Pursuant to the agreement, we owe USC a royalty in the low single-digit percent range of our and our sub-licensee's net sales of products covered by the agreement. In addition, we owe USC an additional royalty in the low single-digit percent range of revenue from our sub-licensees. Once our and our sub-licensees net sales reach an amount in the mid-seven digit dollar range, the minimum annual royalty payment due to USC will be in the low six-digit dollar range. Our royalty obligations continue on a licensed product-by-licensed product and country-by-country basis until the expiration of the last valid claim in the licensed patent covering a licensed product in such country.

The term of this agreement will continue until all of our royalty payment obligations have expired unless terminated earlier. The agreement provides that it may be terminated by either party upon written notice to the other party in the event of the other party's material breach of the agreement if such breach remains uncured for 45 days. We may terminate the agreement without cause upon 45 days' advance written notice to USC. USC may also terminate the agreement upon notice to us upon (i) the declaration by a court of competent jurisdiction that we are bankrupt and our assets are to be liquidated pursuant to the U.S. Bankruptcy Code; (ii) upon the filing or institution by us of bankruptcy, liquidation or receivership proceedings under Chapter 7 of the U.S. Bankruptcy Code; (iii) upon an assignment of a substantial portion of our assets for the benefit of creditors; or (iv) in the event a receiver or custodian is appointed in bankruptcy for all or substantially all of our business; provided, however, that in the case of any involuntary proceeding, such right to terminate shall only become effective if the proceeding is not dismissed within 120 days after the filing thereof. Upon termination of the agreement, all rights granted to or provided by each party to the other shall automatically and irrevocably revert to the granting party.

Grants

In August 2017, we were awarded a $2.0 million grant by the U.S. Food and Drug Administration Office of Orphan Products Development to support our Phase 3 clinical trial, or OOPD Grant. Under the grant agreement, we will be reimbursed for qualifying expenses over a four-year period subject to the availability of funds and satisfactory progress of the trial. At December 31, 2019, we had received $1.5 million relating to the OOPD Grant. We do not anticipate receiving the remaining $0.5 million reimbursement for qualifying expenses.

We have also received grants from the following entities: National Institutes of Health, Voices Against Brain Cancer, Musella Foundation, Accelerate Brain Cancer Cure, Inc., National Brain Tumor Society, American Brain Tumor Association, Adenoid Cystic Carcinoma Research Foundation, and Internal Revenue Service — Qualifying Therapeutic Discovery Project Program.

Sales and Marketing

We currently are not conducting any sales, marketing or distribution activities.

Intellectual Property

Intellectual property is of vital importance in our field and in biotechnology generally. We seek to protect and enhance proprietary technology, inventions, and improvements that are commercially important to the development of our business by seeking, maintaining, and defending patent rights, whether developed internally or licensed from third parties.

We will also seek to rely on regulatory protection afforded through Orphan-Drug Designations, data exclusivity, market exclusivity and patent term extensions where available.

We have obtained Orphan-Drug Designation for Toca 511 & Toca FC for the treatment of malignant glioma in addition to GBM, which makes the product eligible for a period of orphan drug exclusivity, if approved in this indication, under certain conditions. We believe that approval under a biologics license application, or BLA, will be eligible for 12 years of market exclusivity in the United States, 10 years of market exclusivity in Europe and significant durations in other markets, which would be complementary to any relevant patent exclusivity.

Through licensing and developing our own portfolio, and as of December 31, 2019, we have rights to 14 issued patents in the United States, eleven of which are assigned to us and three of which are exclusively licensed to us, and 106 issued and granted patents in foreign countries, 105 of which are assigned to us and one of which is exclusively licensed to us, eight patent applications in the United States, all of which are assigned to us and 52 patent applications in foreign countries, all of which are assigned to us. We believe that the issued patents will provide coverage on our technology platform and product candidates until approximately 2030. We file intellectual property we believe to be key to our business at a minimum in jurisdictions including the United States, Europe and Japan. Our original core technology was licensed from USC and The Regents of the University of California. Families within the portfolio are directed to our RRV technology platform, the modified CD gene that we use in Toca 511, various other therapeutic modalities and genes for use with RRV, manufacturing methods for RRV, the extended release Toca FC formulation, various combination therapies with Toca 511 & Toca FC and other agents, intravenous administration of RRV and diagnostic assays for detection of RRV. Currently there are 119 pending trademarks, five of which are pending in the United States and 114 of which are pending in various jurisdictions outside the United States.

We possess significant knowledge relating to the construction, manufacture, development and protection of gene therapy products. We aim to protect certain intellectual property through a trade secret strategy.

Competition

The biotechnology and biopharmaceutical industries are characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary products. We face competition from many different sources, including commercial pharmaceutical and biotechnology enterprises, academic institutions, government agencies and private and public research institutions.

Many of our competitors have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. Our commercial opportunities will be reduced or eliminated if our competitors develop and commercialize similar products that are safer, more effective, have fewer side effects or are less expensive than any products that we and/or our collaborators may develop.

Government Regulation

New Drug Development and Approval Process

Numerous governmental authorities in the United States and other countries extensively regulate the testing, clinical development, manufacturing and marketing of pharmaceutical products and ongoing research and development activities. In the United States, the FDA rigorously reviews pharmaceutical products under the Federal Food, Drug, and Cosmetic Act and applicable regulations. Non-compliance with FDA regulations can result in administrative and judicial sanctions, including warning or untitled letters, clinical holds, fines, recall or seizure of products, injunctions, total or partial suspension of production, refusal of the government to approve marketing applications or allow entry into supply contracts, refusal to permit import or export of products, civil penalties, criminal prosecution and other actions affecting a company and its products.

Preclinical studies involve laboratory evaluation of product characteristics and animal studies to assess the biological activity and safety of the product. In some cases, long-term preclinical studies are conducted while clinical studies are ongoing. When the preclinical testing is considered adequate by the sponsor to demonstrate the safety and scientific rationale for initial human studies, the results of the preclinical tests, together with manufacturing information and analytical data, are submitted to the FDA as part of an IND submission. The IND becomes effective, if not rejected by the FDA, within 30 days after the FDA receives the IND. The FDA may, either during the 30-day period after filing of an IND or at any future time, impose a clinical hold on proposed or ongoing clinical trials on various grounds, including that the study subjects are or would be exposed to an unreasonable and significant health risk. If the FDA imposes a clinical hold, clinical trials cannot commence or recommence without FDA authorization and then only under terms authorized by the FDA.

Clinical trials involve the administration of the investigational product candidates to humans under the supervision of a qualified principal investigator. Clinical trials must be conducted in accordance with Good Clinical Practices under protocols submitted to the FDA as part of the IND. In addition, each clinical trial must be approved and conducted under the auspices of an Investigational Review Board, or IRB, and with patient informed consent. The IRB typically considers, among other things, ethical factors and the safety of human subjects.

Concurrent with clinical trials and preclinical studies, companies must develop information about the chemistry and physical characteristics of the drug and finalize a process for manufacturing the product. In addition, manufacturers, including contract manufacturers, are required to comply with current applicable FDA Good Manufacturing Practice, or cGMP, regulations. The cGMP regulations include requirements relating to quality control and quality assurance, as well as the corresponding maintenance of records and documentation. The manufacturing process must be capable of consistently producing quality batches of the product and the manufacturer must develop methods for testing the quality, purity and potency of the final drugs. Additionally, appropriate packaging must be selected and tested and chemistry stability studies must be conducted to demonstrate that the product does not undergo unacceptable deterioration over its shelf-life.

After the completion of the clinical trial phases of development, if the sponsor concludes that there is substantial evidence that the drug candidate is safe and effective for its intended use, the sponsor may submit a NDA/BLA to the FDA.

If the FDA approves an application, the drug becomes available for physicians to prescribe.

Any products manufactured or distributed pursuant to FDA approvals are subject to continuing regulation by the FDA, including record keeping requirements, reporting of adverse experiences with the drug, drug sampling and distribution requirements, notifying the FDA and gaining its approval of certain manufacturing or labeling changes, complying with certain electronic records and signature requirements, and complying with FDA promotion and advertising requirements. Drug manufacturers and their subcontractors are required to register their establishments and are subject to periodic unannounced inspections for compliance with cGMP requirements. Also, newly discovered or developed safety or effectiveness data may require changes to a product's approved labeling, including the addition of new warnings and contraindications, or even in some instances revocation or withdrawal of the product's approval. In addition, prescription drugs may be promoted only for the approved indications in accordance with the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label may be subject to significant liability. However, physicians may, in their independent medical judgment, prescribe legally available products for off-label uses. The FDA does not regulate the behavior of physicians in their choice of treatments but the FDA does restrict manufacturer’s communications on the subject of off-label use of their products.

Pharmaceutical Pricing and Reimbursement

We currently have no marketed products. In both domestic and foreign markets, sales of any products for which we receive regulatory approval for commercial sale will depend in part on the availability of reimbursement from third-party payors. Third-party payors include government authorities or programs, managed care providers, private health insurers and other organizations. These third-party payors are increasingly challenging the price and examining the cost-effectiveness of medical products and services. In addition, significant uncertainty exists as to the reimbursement status of newly approved healthcare products. We may need to conduct expensive pharmacoeconomic studies in order to demonstrate the cost-effectiveness of our products. Our product candidates may not be considered cost-effective. Adequate third-party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development. Third-party payors may also control access to, or manage utilization of, our products with various utilization management techniques, such as requiring prior authorization for coverage of our products.

Within the United States, if we obtain appropriate approval in the future to market any of our drug product candidates, those products could potentially be covered by various government health benefit programs as well as purchased by government agencies. The participation in such programs or the sale of products to such agencies is subject to regulation. The marketability of any products for which we receive regulatory approval for commercial sale may suffer if the government and third-party payors fail to provide adequate coverage and reimbursement.

Medicaid is a joint federal and state program that is administered by the states for low income and disabled beneficiaries. Under the Medicaid Drug Rebate Program, participating manufacturers are required to pay a rebate for each unit of product reimbursed by the state Medicaid programs. The amount of the rebate for each product is set by law and may be subject to an additional discount if certain pricing increases more than inflation.

Medicare is a federal program that is administered by the federal government that covers individuals age 65 and over as well as those with certain disabilities. Drugs may be covered under Medicare Part D. Medicare Part D provides coverage to enrolled Medicare patients for self-administered drugs (*i.e.*, drugs that do not need to be injected or otherwise administered by a physician). Medicare Part D is administered by private prescription drug plans approved by the U.S. government and each drug plan establishes its own Medicare Part D formulary for prescription drug coverage and pricing, which the drug plan may modify from time-to-time. The prescription drug plans negotiate pricing with manufacturers and may condition formulary placement on the availability of manufacturer discounts. Since 2011, manufacturers with marketed brand name drugs have been required to provide a 50% discount the negotiated price for on brand name prescription drugs utilized by Medicare Part D beneficiaries when those beneficiaries reach the coverage gap in their drug benefits, and, beginning in 2019, that discount increased to 70%.

Drug products are subject to discounted pricing when purchased by federal agencies via the Federal Supply Schedule (FSS). FSS participation is required for a drug product to be covered and reimbursed by certain federal agencies and for coverage under Medicaid, Medicare Part B and the Public Health Service (PHS) pharmaceutical pricing program. FSS pricing is negotiated periodically with the Department of Veterans Affairs. FSS pricing is intended not to exceed the price that a manufacturer charges its most-favored non-federal customer for its product. In addition, prices for drugs purchased by the Veterans Administration, Department of Defense (including drugs purchased by military personnel and dependents through the TRICARE retail pharmacy program), Coast Guard, and PHS are subject to a cap on pricing (known as the "federal ceiling price") and may be subject to an additional discount if pricing increases more than the rate of inflation.

To maintain coverage of drugs under the Medicaid Drug Rebate Program, manufacturers are required to extend discounts to certain purchasers under the PHS pharmaceutical pricing program. Purchasers eligible for discounts include hospitals that serve a disproportionate share of financially needy patients, community health clinics and other entities that receive health services grants from the PHS.

The United States and state governments continue to propose and pass legislation designed to reform delivery of, or payment for, health care, which include initiatives to reduce the cost of healthcare. For example, in March 2010, the United States Congress enacted the Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act, or the Healthcare Reform Act, which includes changes to the coverage and reimbursement of drug products under government health care programs. Under the Trump administration, there have been ongoing efforts to modify or repeal all or certain provisions of the Healthcare Reform Act. For example, tax reform legislation was enacted at the end of 2017 that eliminates the tax penalty for individuals who do not maintain sufficient health insurance coverage beginning in 2019 (the so-called "individual mandate"). "). In addition, the 2020 federal spending package permanently eliminates, effective January 1, 2020, the Health Care Reform Act's mandated "Cadillac" tax on high-cost employer-sponsored health coverage and medical device tax and, effective January 1, 2021, also eliminates the health insurer tax. The Healthcare Reform Act has also been subject to judicial challenge. On December 18, 2019, the Court of Appeals for the 5th Circuit upheld the district court ruling that the individual mandate was unconstitutional and remanded the case back to the district court to determine whether the remaining provisions of the Healthcare Reform Act are invalid as well. It is unclear how this decision, future decisions, subsequent appeals, and other efforts to repeal and replace the Healthcare Reform Act will impact the Healthcare Reform Act and our business.

Recently, there has been considerable public and government scrutiny in the U.S. of pharmaceutical pricing and proposals to address the perceived high cost of pharmaceuticals. At the federal level, the Trump Administration's budget proposal for fiscal year 2020 contained further drug price control measures that could be enacted during the budget process or in other future legislation, including, for example, measures to permit Medicare Part D plans to negotiate the price of certain drugs under Medicare Part B, to allow some states to negotiate drug prices under Medicaid, and to eliminate cost sharing for generic drugs for low-income patients. In addition, in May of 2018, President Trump and the Secretary of the Department of Health and Human Services released a "blueprint" to lower prescription drug prices and out-of-pocket costs. The Department of Health and Human Services, or HHS, solicited feedback on some of these measures and has implemented others under its existing authority. For example, in May 2019, CMS issued a final rule to allow Medicare Advantage plans the option to use step therapy for Part B drugs beginning January 1, 2020. This final rule codified CMS's policy change that was effective January 1, 2019. While some of these and other measures may require additional authorization to become effective, Congress and the Trump Administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. Such measures could cause significant operational and reimbursement changes for the pharmaceutical industry.

There have also been several recent state legislative efforts to address drug costs, which generally have focused on increasing transparency around drug costs or limiting drug prices or price increases. For example, at the state level, legislatures have increasingly passed legislation and implemented regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. Adoption of new legislation at the federal or state level could affect demand for, or pricing of, our product candidates if approved for sale.

We cannot predict the ultimate content, timing or effect of any changes to the Healthcare Reform Act or other federal and state reform efforts. There is no assurance that federal or state health care reform will not adversely affect our future business and financial results.

Other Healthcare Laws

We are currently or will in the future be subject to healthcare regulation and enforcement by the federal government and the states in which we may conduct our business if our product candidates are approved by the FDA and commercialized in the United States. In addition to the FDA's restrictions on marketing of pharmaceutical products, the U.S. healthcare laws and regulations that may affect our ability to operate include federal and state fraud and abuse laws, including the anti-kickback and false claims laws; data privacy and security laws; and transparency laws related to payments and/or other transfers of value made to physicians and other healthcare professionals and teaching hospitals.

Anti-kickback laws, among other things, prohibit entities and individuals from soliciting, offering, receiving, or paying any remuneration to induce, or in return for, either the referral of an individual, 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. False claims laws prohibit, among other things, anyone from knowingly and willingly presenting, or causing to be presented, any claims for payment for reimbursed drugs or services to third party payors (including Medicare and Medicaid) that are false or fraudulent.

The federal physician payment transparency requirements created under the Healthcare Reform Act requires 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 Centers for Medicare & Medicaid Services, or CMS, information related to certain payments or other transfers of value made to physicians, as defined by such law, and teaching hospitals and ownership or investment interests held by such healthcare professionals and their immediate family members.

The federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, 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 use, or disclosure of, individually identifiable health information, relating to the privacy, security, and transmission of such individually identifiable health information.

Many states have similar laws and regulations that may differ from each other and federal law in significant ways, thus complicating compliance efforts. For example, states have anti-kickback and false claims laws that may be broader in scope than analogous federal laws and may apply regardless of payer. In addition, state data privacy laws that protect the security of health information may differ from each other and may not be preempted by federal law. Moreover, several states have enacted legislation requiring pharmaceutical manufacturers to, among other things, establish marketing compliance programs, file periodic reports with the state, make periodic public disclosures on sales and marketing activities, report information related to drug pricing, require the registration of sales representatives, and prohibit certain other sales and marketing practices.

If our operations are found to be in violation of these laws, we may be subject to significant civil, criminal, and administrative penalties, including, without limitation, damages, fines, imprisonment, exclusion from participation in government healthcare programs, 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 the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

Employees

As of December 31, 2019, we had 29 total employees, all of which were full-time employees. Of these full-time employees, 20 employees are engaged in research and development activities and 9 employees are engaged in finance and general management activities including accounting, contracts, human resources, information technology, investor relations, marketing and business development.

Corporate Information

We were incorporated in Delaware in August 2007. Our principal executive offices are located at 4242 Campus Point Court, Suite 600, San Diego, California 92121. Our telephone number is (858) 412-8400. Our website address is www.tocagen.com.

This Annual Report on Form 10-K, our Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and any amendments to those reports filed or furnished pursuant to Sections 13(a) and 15(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, are available (free of charge) on our website as soon as reasonably practicable after we electronically file such material with, or furnish it to, the Securities and Exchange Commission, or SEC.

Information contained on, or that can be accessed through, our website or social medial sites does not constitute part of this Annual Report on Form 10-K or any other report or document we file with the SEC, and any references to our website and social media sites are intended to be inactive textual references only.

Tocagen, the Tocagen logo and other trademarks or service marks of Tocagen are the property of Tocagen. Other service marks, trademarks, and tradenames referred to in this Annual Report on Form 10-K are the property of their respective owners. Except as set forth above and solely for convenience, the trademarks and tradenames in this Annual Report on Form 10-K are referred to without the ® and ™ symbols, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

We are an “emerging growth company” as defined in the JOBS Act. We will remain an emerging growth company until the earliest of (i) the last day of our first fiscal year in which we have total annual gross revenues of $1 billion or more, (ii) the date on which we are deemed to be a “large accelerated filer” under the rules of the SEC with at least $700 million of outstanding equity securities held by non-affiliates, (iii) the date on which we issued more than $1 billion in non-convertible debt during the previous three years, or (iv) December 31, 2022. References herein to “emerging growth company” are intended to have the meaning associated with it in the JOBS Act.

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 in this section as well as those discussed in "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and the related notes when evaluating our business. 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 the Proposed Merger

The exchange ratio set forth in the Merger Agreement is not adjustable based on the market price of our common stock, so the merger consideration at the closing of the Merger may have a greater or lesser value than at the time the Merger Agreement was signed.

The Merger Agreement has set the exchange ratio for the Forte capital stock, and the exchange ratio is based on the outstanding capital stock of Forte and the outstanding common stock of Tocagen, in each case immediately prior to the closing of the Merger. Applying the exchange ratio formula in the Merger Agreement, the former Forte equityholders immediately before the Merger are expected to own approximately 74.5% of the outstanding capital stock of Tocagen immediately following the Merger, and the equityholders of Tocagen immediately before the Merger are expected to own approximately 25.5% of the outstanding capital stock of Tocagen immediately following the Merger, on a fully diluted basis using the treasury stock method subject to certain assumptions. Under certain circumstances further described in the Merger Agreement, however, these ownership percentages may be adjusted upward or downward based on cash levels of the respective companies at the closing of the Merger, and as a result, either our stockholders or the Forte stockholders could own less of the combined company than expected.

Any changes in the market price of our common stock before the completion of the Merger will not affect the number of shares of our common stock issuable to Forte's stockholders pursuant to the Merger Agreement. Therefore, if before the completion of the Merger the market price of our common stock declines from the market price on the date of the Merger Agreement, then Forte's stockholders could receive merger consideration with substantially lower value than the value of such merger consideration on the date of the Merger Agreement. Similarly, if before the completion of the Merger the market price of our common stock increases from the market price of our common stock on the date of the Merger Agreement, then Forte's stockholders could receive merger consideration with substantially greater value than the value of such merger consideration on the date of the Merger Agreement. The Merger Agreement does not include a price-based termination right. Because the exchange ratio does not adjust as a result of changes in the market price of our common stock, for each one percentage point change in the market price of our common stock, there is a corresponding one percentage point rise or decline, respectively, in the value of the total merger consideration payable to Forte's stockholders pursuant to the Merger Agreement.

Failure to complete the proposed Merger may result in Tocagen and Forte paying a termination fee to the other party and could significantly harm the market price of our common stock and negatively affect the future business and operations of each company.

If the proposed Merger is not completed and the Merger Agreement is terminated under certain circumstances, we may be required to pay Forte a termination fee of up to $750,000. Even if a termination fee is not payable in connection with a termination of the Merger Agreement, each of Tocagen and Forte will have incurred significant fees and expenses, which must be paid whether or not the Merger is completed. Further, if the proposed Merger is not completed, it could significantly harm the market price of our common stock.

In addition, if the Merger Agreement is terminated and the board of directors of Tocagen or Forte determines to seek another business combination, there can be no assurance that either we or Forte will be able to find a partner and close an alternative transaction on terms that are as favorable or more favorable than the terms set forth in the Merger Agreement.

The proposed Merger is subject to approval of the Merger Agreement by our stockholders and the Forte stockholders. Failure to obtain these approvals would prevent the closing of the Merger.

Before the proposed Merger can be completed, the stockholders of each of Tocagen and Forte must approve the Merger Agreement. Failure to obtain the required stockholder approvals, may result in a material delay in, or the abandonment of, the Merger. Any delay in completing the proposed Merger may materially adversely affect the timing and benefits that are expected to be achieved from the proposed Merger.

The Merger may be completed even though certain events occur prior to the closing that materially and adversely affect Tocagen or Forte.

The Merger Agreement provides that either Tocagen or Forte can refuse to complete the proposed Merger if there is a material adverse change affecting the other party between February 19, 2020, the date of the Merger Agreement, and the closing of the Merger that is continuing. However, certain types of changes do not permit either party to refuse to complete the proposed Merger, even if such change could be said to have a material adverse effect on Tocagen or Forte, including:

- general business, economic or political conditions or conditions generally affecting the industries in which Forte or Tocagen, as applicable, operates;
- any natural disaster or any acts of war, armed hostilities or terrorism;
- any changes in financial, banking or securities markets;
- with respect to Tocagen, any change in the stock price or trading volume of Tocagen excluding any underlying effect that may have caused such change;
- with respect to Tocagen, failure to meet internal or analysts' expectations or projects or the results of operations;
- with respect to Forte, failure to meet internal projections or forecasts or third party revenue or earnings predictions;
- any change in accounting requirements or principles or any change in applicable laws, rules, or regulations or the compliance with or interpretation thereof;
- any effect resulting from the announcement or pendency of the proposed Merger or any related transactions; and
- the taking of any action, or the failure to take any action, by either Tocagen or Forte required to comply with the terms of the Merger Agreement.

If adverse changes occur and Tocagen and Forte still complete the Merger, the market price of the combined organization's common stock may suffer. This in turn may reduce the value of the Merger to the stockholders of Tocagen, Forte or both.

Some Tocagen and Forte officers and directors have interests in the proposed Merger that are different from the respective stockholders of Tocagen and Forte and that may influence them to support or approve the Merger without regard to the interests of the respective stockholders of Tocagen and Forte.

Certain officers and directors of Tocagen and Forte participate in arrangements that provide them with interests in the proposed Merger that are different from the interests of the respective stockholders of Tocagen and Forte, including, among others, the continued service as an officer or director of the combined organization, severance benefits, the acceleration of stock option vesting, continued indemnification and the potential ability to sell an increased number of shares of common stock of the combined organization in accordance with Rule 144 under the Securities Act of 1933, as amended.

For example, we have entered into certain employment and severance benefits agreements with certain of our executive officers that may result in the receipt by such executive officers of cash severance payments and other benefits in the event of a covered termination of employment of each executive officer's employment. The closing of the Merger will also result in the acceleration of vesting of options to purchase shares of our common stock held by our executive officers and directors, whether or not there is a covered termination of such officer's employment. In addition, and for example, certain of Forte's directors and executive officers have options, subject to vesting, to purchase shares of Forte's common stock which, at the closing of the Merger, shall be converted into and become options to purchase shares of our common stock, certain of Forte's directors and executive officers are expected to become directors and executive officers of Tocagen upon the closing of the Merger, and all of Forte's directors and executive officers are entitled to certain indemnification and liability insurance coverage pursuant to the terms of the Merger Agreement. These interests, among others, may influence the officers and directors of Tocagen and Forte to support or approve the proposed Merger.

The market price of our common stock following the Merger may decline as a result of the Merger.

The market price of our common stock may decline as a result of the Merger for a number of reasons including if:

- investors react negatively to the prospects of the combined organization's product candidates, business and financial condition following the Merger;
- the effect of the Merger on the combined organization's business and prospects is not consistent with the expectations of financial or industry analysts; or
- the combined organization does not achieve the perceived benefits of the Merger as rapidly or to the extent anticipated by financial or industry analysts.

Tocagen and Forte equityholders will have a reduced ownership and voting interest in, and will exercise less influence over the management of, the combined organization following the closing of the Merger as compared to their current ownership and voting interest in the respective companies.

After the completion of the Merger, the current securityholders of Tocagen and Forte will own a smaller percentage of the combined organization than their ownership in their respective companies prior to the Merger. Immediately after the Merger, it is currently estimated that Forte equityholders will own approximately 74.5% of the common stock of the combined organization, and Tocagen equityholders, whose shares of Tocagen common stock will remain outstanding after the Merger, will own approximately 25.5% of the common stock of the combined organization, on a fully diluted basis using the treasury stock method subject to certain assumptions. These estimates are based on the anticipated exchange ratio and are subject to adjustment as provided in the Merger Agreement. See also the risk factor above titled, "*The exchange ratio is not adjustable based on the market price of Tocagen common stock, so the merger consideration at the closing may have a greater or lesser value than at the time the Merger Agreement was signed.*"

In addition, the 8 member board of directors of the company will initially include 6 individuals with prior affiliations with Forte and 2 individuals with prior affiliations with Tocagen. Consequently, securityholders of Tocagen and Forte will be able to exercise less influence over the management and policies of the combined organization following the closing of the Merger than they currently exercise over the management and policies of their respective companies.

Tocagen and Forte stockholders may not realize a benefit from the Merger commensurate with the ownership dilution they will experience in connection with the Merger.

If the combined organization is unable to realize the strategic and financial benefits currently anticipated from the proposed Merger, Tocagen's and Forte's stockholders will have experienced substantial dilution of their ownership interests in their respective companies without receiving the expected commensurate benefit, or only receiving part of the commensurate benefit to the extent the combined organization is able to realize only part of the expected strategic and financial benefits currently anticipated from the proposed Merger.

The combined company will need to raise additional capital by issuing securities or debt or through licensing or other strategic arrangements, which may cause dilution to the combined company's stockholders or restrict the combined company's operations or impact its proprietary rights.

The combined company may be required to raise additional funds sooner than currently planned. In this regard, the exchange ratio may be impacted by cash levels of the respective companies at the closing of the Merger. The Merger Agreement conditions the completion of the Merger upon Tocagen holding a minimum amount of cash greater than or equal to $3,000,000 at the effective time of the Merger. The Merger Agreement does not condition the completion of the Merger upon Forte holding a minimum amount of cash at the effective time of the Merger. If either or both of Tocagen or Forte hold less cash at the time of the closing Merger than the parties currently expect, the combined company will need to raise additional capital sooner than expected. Additional financing may not be available to the combined company when it needs it or may not be available on favorable terms. To the extent that the combined company raises additional capital by issuing equity securities, such an issuance may cause significant dilution to the combined company's stockholders' ownership and the terms of any new equity securities may have preferences over the combined company's common stock. Any debt financing the combined company enters into may involve covenants that restrict its operations. These restrictive covenants may include limitations on additional borrowing and specific restrictions on the use of the combined company's assets, as well as prohibitions on its ability to create liens, pay dividends, redeem its stock or make investments. In addition, if the combined company raises additional funds through licensing, partnering or other strategic arrangements, it may be necessary to relinquish rights to some of the combined company's technologies or product candidates and proprietary rights, or grant licenses on terms that are not favorable to the combined company.

During the pendency of the proposed Merger, Tocagen and Forte may not be able to enter into a business combination with another party at a favorable price because of restrictions in the Merger Agreement, which could adversely affect their respective businesses.

Covenants in the Merger Agreement impede the ability of Tocagen and Forte to make acquisitions, subject to certain exceptions relating to fiduciary duties, as set forth below, or to complete other transactions that are not in the ordinary course of business pending completion of the proposed Merger. As a result, if the Merger is not completed, the parties may be at a disadvantage to their competitors during such period. In addition, while the Merger Agreement is in effect, each party is generally prohibited from soliciting, initiating, encouraging or entering into certain extraordinary transactions, such as a merger, sale of assets, or other business combination outside the ordinary course of business with any third party, subject to certain exceptions relating to fiduciary duties. Any such transactions could be favorable to such party's stockholders.

Certain provisions of the Merger Agreement may discourage third parties from submitting alternative takeover proposals, including proposals that may be superior to the arrangements contemplated by the Merger Agreement.

The terms of the Merger Agreement prohibit each of Tocagen and Forte from soliciting alternative takeover proposals or cooperating with persons making unsolicited takeover proposals, except in limited circumstances when such party's board of directors determines in good faith that an unsolicited alternative takeover proposal is or is reasonably likely to lead to a superior takeover proposal and that failure to cooperate with the proponent of the proposal would be reasonably likely to be inconsistent with the applicable board's fiduciary duties.

Because the lack of a public market for Forte's capital stock makes it difficult to evaluate the value of Forte's capital stock, the stockholders of Forte may receive shares of our common stock in the Merger that have a value that is less than, or greater than, the fair market value of Forte's capital stock.

The outstanding capital stock of Forte is privately held and is not traded in any public market. The lack of a public market makes it extremely difficult to determine the fair market value of Forte. Because the percentage of our common stock to be issued to Forte's stockholders was determined based on negotiations between the parties, it is possible that the value of our common stock to be received by Forte's stockholders will be less than the fair market value of Forte, or Tocagen may pay more than the aggregate fair market value for Forte.

If the conditions to the Merger are not met, the Merger will not occur.

Even if the Merger is approved by the stockholders of Tocagen and Forte, specified conditions must be satisfied or waived to complete the Merger. We cannot assure you that all of the conditions will be satisfied or waived. If the conditions are not satisfied or waived, the Merger will not occur or will be delayed, and Tocagen and Forte each may lose some or all of the intended benefits of the proposed Merger.

Litigation relating to the proposed Merger could require Tocagen or Forte to incur significant costs and suffer management distraction, and could delay or enjoin the proposed Merger.

Tocagen and Forte could be subject to demands or litigation related to the proposed Merger, whether or not the Merger is consummated. Such actions may create uncertainty relating to the Merger, or delay or enjoin the Merger.

There is no assurance that the proposed Merger will be completed in a timely manner or at all. If the proposed Merger is not consummated, our business could suffer materially and our stock price could decline.

The closing of the proposed Merger is subject to the satisfaction or waiver of a number of closing conditions, as described above, including the required approvals by Tocagen and Forte stockholders and other customary closing conditions. See the risk factors above titled, "*The proposed Merger is subject to approval of the Merger Agreement by our stockholders and the Forte stockholders. Failure to obtain these approvals would prevent the closing of the Merger*" and "*If the conditions to the Merger are not met, the Merger will not occur.*" If the conditions are not satisfied or waived, the proposed Merger may be materially delayed or abandoned. If the proposed Merger is not consummated, our ongoing business may be adversely affected and, without realizing any of the benefits of having consummated the proposed Merger, we will be subject to a number of risks, including the following:

- we have incurred and expect to continue to incur significant expenses related to the proposed Merger even if the Merger is not consummated;
- we could be obligated to pay Forte a termination fee of up to $750,000 under certain circumstances set forth in the Merger Agreement;
- the market price of our common stock may decline to the extent that the current market price reflects a market assumption that the proposed Merger will be completed; and
- matters relating to the proposed Merger have required and will continue to require substantial commitments of time and resources by our remaining management and employees, which could otherwise have been devoted to other opportunities that may have been beneficial to us.

We also could be subject to litigation related to any failure to consummate the proposed Merger or to perform our obligations under the Merger Agreement. If the proposed Merger is not consummated, these risks may materialize and may adversely affect our business, financial condition and the market price of our common stock.

If the proposed Merger is not completed, we may be unsuccessful in completing an alternative transaction on terms that are as favorable as the terms of the proposed Merger with Forte, or at all, and we may otherwise be unable to continue to operate our business. Our board of directors may decide to pursue a dissolution and liquidation of Tocagen. In such an event, the amount of cash available for distribution to our stockholders will depend heavily on the timing of such liquidation as well as the amount of cash that will need to be reserved for commitments and contingent liabilities.

Our assets currently consist primarily of cash, cash equivalents and short-term investments, our RRV platform assets, other preclinical program assets, the remaining value, if any, of our deferred tax assets, our listing on The Nasdaq Global Select Market and the Merger Agreement with Forte. While we have entered into the Merger Agreement with Forte, the closing of the proposed Merger may be delayed or may not occur at all and there can be no assurance that the proposed Merger will deliver the anticipated benefits we expect or enhance stockholder value. If we are unable to consummate the proposed Merger, our board of directors may elect to pursue an alternative strategy, one of which may be a strategic transaction similar to the proposed Merger. Attempting to complete an alternative transaction like the proposed Merger will be costly and time consuming, and we can make no assurances that such an alternative transaction would occur at all. Alternatively, our board of directors may elect to continue our operations to advance the preclinical and clinical development of our programs, which would require that we obtain additional funding, and to resume our efforts to seek potential collaborative, partnering or other strategic arrangements for our programs, including a sale or other divestiture of our program assets, or our board of directors could instead decide to pursue a dissolution and liquidation of our company. In such an event, the amount of cash available for distribution to our stockholders will depend heavily on the timing of such decision, and with the passage of time the amount of cash available for distribution will be reduced as we continue to fund our operations. In addition, if our board of directors were to approve and recommend, and our stockholders were to approve, a dissolution and liquidation of our company, we would be required under Delaware corporate law to pay our outstanding obligations, as well as to make reasonable provision for contingent and unknown obligations, prior to making any distributions in liquidation to our stockholders. Our commitments and contingent liabilities may include severance obligations, regulatory and preclinical obligations, and fees and expenses related to the proposed Merger. As a result of this requirement, a portion of our assets may need to be reserved pending the resolution of such obligations. In addition, we may be subject to litigation or other claims related to a dissolution and liquidation. If a dissolution and liquidation were pursued, our board of directors, in consultation with its advisors, would need to evaluate these matters and make a determination about a reasonable amount to reserve. Accordingly, holders of our common stock could lose all or a significant portion of their investment in the event of a liquidation, dissolution or winding up of the company.

The issuance of shares of our common stock to Forte stockholders in the proposed Merger will substantially dilute the voting power of our current stockholders.

If the proposed Merger is completed, each outstanding share of Forte common stock will be converted into the right to receive a number of shares of our common stock equal to the exchange ratio determined pursuant to the Merger Agreement. Immediately following the Merger, the former Forte equityholders immediately before the Merger are expected to own approximately 74.5% of our outstanding capital stock, and our equityholders immediately before the Merger are expected to own approximately 25.5% of our outstanding capital stock, on a fully diluted basis using the treasury stock method subject to certain assumptions. Accordingly, the issuance of shares of our common stock to Forte stockholders in the Merger will reduce significantly the relative voting power of each share of Tocagen common stock held by our current stockholders. Consequently, our stockholders as a group will have significantly less influence over the management and policies of the combined company after the Merger than prior to the Merger. These estimates are based on the anticipated exchange ratio and are subject to adjustment as provided in the Merger Agreement. See also the risk factor above titled, "*The exchange ratio is not adjustable based on the market price of Tocagen common stock, so the merger consideration at the closing may have a greater or lesser value than at the time the Merger Agreement was signed.*"

Other risks related to our business and financial condition

We have incurred losses since inception, and we anticipate that we will incur continued losses for the foreseeable future.

We are not profitable and have incurred net losses in each year since our inception in 2007, including net losses of $63.5 million, $49.0 million and $38.9 million for the years ended December 31, 2019, 2018 and 2017, respectively. As of December 31, 2019 we had an accumulated deficit of $279.4 million.

We expect to incur significant operating losses for the foreseeable future depending on the extent of our preclinical and any clinical development activities. These losses, among other things, have had and will continue to have an adverse effect on our stockholders' equity and working capital.

A substantial portion of our recent efforts and expenditures have been devoted to, and our prospects were substantially dependent upon, the development of Toca 511 & Toca FC for the treatment of recurrent high grade glioma. We conducted a randomized, controlled Phase 3 clinical trial (Toca 5) of Toca 511 & Toca FC in patients with recurrent HGG, which was designed to serve as a registrational trial. We received the data from this trial in September 2019. At the final analysis, the trial missed the primary endpoint of overall survival compared to the standard of care treatment (11.1 months median compared to 12.2 months, HR=1.06, p=0.6154). In addition, all secondary endpoints showed no meaningful difference between the arms of the trial. The failure of the Toca 5 trial to achieve its primary and secondary endpoints has significantly depressed our stock price and has severely harmed our ability to raise additional capital and to secure potential collaborative, partnering or other strategic arrangements for our programs, and consequently, our prospects to continue as a going concern have been severely diminished. Following our review of the full data sets from the Toca 5 trial, we determined to discontinue further development of Toca 511 & Toca FC. We continue our efforts to seek potential collaborative, partnering or other strategic arrangements for our programs, including a sale or other divestiture of our program assets. If we are unable to ultimately enter into any such arrangements, we will not receive any return on our investment in Toca 511 & Toca FC.

We are substantially dependent on our remaining employees to facilitate the consummation of the proposed Merger.

We have substantially reduced our workforce since September 2019 and as of February 17, 2020, we had only 24 full-time employees, of which, 12 full-time employees last day will be March 16, 2020 and 7 full-time employees last day will be April 14, 2020, leaving 5 active full-time employees from April 14, 2020 through the close of the proposed Merger. Our ability to successfully complete the proposed Merger depends in large part on our ability to retain certain of our remaining personnel. Despite our efforts to retain these employees, one or more may terminate their employment with us on short notice. The loss of the services of any of these employees could potentially harm our ability to consummate the proposed Merger, to run our day-to-day business operations, as well as to fulfill our reporting obligations as a public company.

Management transition creates uncertainties and could harm our business.

We have in the past, and may again in the future, experience significant changes in executive leadership. Changes to company strategy, which can often times occur with the appointment of new executives, can create uncertainty, may negatively impact our ability to execute quickly and effectively, and may ultimately be unsuccessful. In addition, executive leadership transition periods are often difficult as the new executives gain detailed knowledge of our operations, and friction can result from changes in strategy and management style. Management transition inherently causes some loss of institutional knowledge, which can negatively affect strategy and execution. Until we integrate new personnel, and unless they are able to succeed in their positions, we may be unable to successfully manage and grow our business, and our results of operations and financial condition could suffer as a result. In any event, changes in our organization as a result of executive management transition may have a disruptive impact on our ability to implement our strategy and could have a material adverse effect on our business, financial condition and results of operations.

The pendency of the proposed Merger could have an adverse effect on the trading price of our common stock and our business, financial condition and prospects.

While there have been no significant adverse effects to date, the pendency of the proposed Merger could disrupt our business in many ways, including:

- the attention of our remaining management and employees may be directed toward the completion of the proposed Merger and related matters and may be diverted from our day-to-day business operations; and
- third parties may seek to terminate or renegotiate their relationships with us as a result of the proposed Merger, whether pursuant to the terms of their existing agreements with us or otherwise.

Should they occur, any of these matters could adversely affect the trading price of our common stock or harm our business, financial condition and prospects.

We are dependent on ApolloBio to develop and commercialize Toca 511 & Toca FC within the greater China region, including mainland China, Hong Kong, Macao and Taiwan. Failure of ApolloBio or any other third parties to successfully develop and commercialize Toca 511 & Toca FC in the applicable jurisdictions could have a material adverse effect on our business.

We have granted ApolloBio an exclusive license to develop and commercialize Toca 511 & Toca FC within the greater China region, including mainland China, Hong Kong, Macao and Taiwan. We have limited contractual rights to force ApolloBio to invest significantly in the development and commercialization of Toca 511 & Toca FC.

In the event that ApolloBio or any other third party with any future development and commercialization rights to any of our product candidates fails to adequately develop and commercialize those product candidates because they lack adequate financial or other resources, decide to focus on other initiatives or otherwise, our ability to successfully develop and commercialize our product candidates in the applicable jurisdictions would be limited, which would adversely affect our business, financial condition, results of operations and prospects. In addition, our license agreement with ApolloBio may be terminated by either party upon a material breach by the other party that remains uncured following 60 days (or, with respect to any payment breach, 10 days) after the date of written notice of such breach, may be terminated by ApolloBio at any time by providing us 90 days' prior written notice and may be terminated by us upon written notice to ApolloBio under specified circumstances if ApolloBio challenges the licensed patent rights. If we or ApolloBio terminate our license agreement, our ability to develop and commercialize Toca 511 & Toca FC within the greater China region, including mainland China, Hong Kong, Macao and Taiwan, would be materially harmed.

The terms of our Loan Agreement place restrictions on our operating and financial flexibility.

In May 2018, we entered into a Loan Agreement with Oxford Finance LLC and Silicon Valley Bank, as amended in August 2018 and further amended in October 2019, which is secured by substantially all of our assets and intellectual property. We borrowed $26.5 million upon execution of the Loan Agreement. Approximately $8.6 million of the proceeds received was used to repay the outstanding principal, interest and final payment fees owed under our prior loan and security agreement. In October 2019, in connection with the second amendment to the Loan Agreement, we made a prepayment of $23.3 million, which amount was used to prepay (A) a portion equal to $21.5 million of the outstanding principal of the Term Loans plus all accrued and unpaid interest thereon through the prepayment date, (B) pro rated portion of the final payment with respect to the portion of such Term Loans being prepaid, plus (C) all outstanding Lenders' expenses as of the amendment date.

The Loan 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 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 Agreement, including foreclosure against our properties securing the Loan 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 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 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.

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.

Our business could be negatively impacted by cyber security threats.

In the ordinary course of our business, we use our data centers and our networks to store and access our proprietary business information. We face various cyber security threats, including cyber security attacks to our information technology infrastructure and attempts by others to gain access to our proprietary or sensitive information. The procedures and controls we use to monitor these threats and mitigate our exposure may not be sufficient to prevent cyber security incidents. The result of these incidents could include disrupted operations, lost opportunities, misstated financial data, liability for stolen assets or information, increased costs arising from the implementation of additional security protective measures, litigation and reputational damage. Any remedial costs or other liabilities related to cyber security incidents may not be fully insured or indemnified by other means.

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.

We may be subject, directly or indirectly, to federal, state, local and foreign healthcare fraud and abuse laws, false claims laws, privacy laws and other applicable 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.

In addition, our current and future operations are subject to regulation under such laws, and 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, along with our costs associated with compliance with such laws. 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 promotion of our products, structuring of 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, including the federal civil False Claims Act, which can be enforced by individuals on behalf of the government through civil whistleblower or *qui tam* actions, and civil monetary penalty laws, which impose criminal and civil penalties 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 federal healthcare programs 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 federal civil 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 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, 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 Healthcare Reform 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 Centers for Medicare & Medicaid Services, or CMS, 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. Beginning in 2022, applicable manufacturers also will be required to report such information regarding payments and transfers of value provided, as well as ownership and investment interests held, during the previous year to physician assistants, nurse practitioners, clinical nurse specialists, certified nurse anesthetists and certified nurse-midwives;
- the U.S. Federal Food, Drug and Cosmetic Act, or FD&C Act, 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, local 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, local 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; to report information related to payments and other transfers of value to healthcare providers or entities, or marketing expenditures; report certain information regarding drug pricing; and require registration of pharmaceutical sales representatives. 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.

In the European Union, the General Data Protection Regulation (2016/679), or GDPR, applies to any organization established in the European Union, and in some cases to activities of organizations that are not established in the European Union. The GDPR, which is wide-ranging in scope, imposes several requirements relating to control over personal data by individuals to whom personal data relates, the information that an organization must provide to individuals, the documentation an organization must maintain, the security and confidentiality of personal data, data breach notification and the use of third party processors in connection with the processing of personal data. The GDPR also imposes strict rules on the transfer of personal data out of the European Union to the United States, provides an enforcement authority, and authorizes fines of up to 20 million Euros or up to 4% of an organization's annual global turnover, whichever is greater, for non-compliance. Additionally, the California Consumer Privacy Act, or CCPA, goes into effect on January 1, 2020. The CCPA creates new individual privacy rights for consumers (as that word is broadly defined in the law) and places increased privacy and security obligations on many organizations that handle the personal data of consumers or households. When the CCPA becomes effective, it will require covered companies to provide new disclosures to California consumers, provide a new right for consumers to opt-out of certain sales of personal information, and provide a new cause of action for data breaches in some cases. The California Attorney General is expected to issue regulations regarding the CCPA later this year. Several amendments have been proposed in the California legislature that would modify the CCPA before it goes into effect, but it remains unclear what, if any, modifications may be made to this legislation. As currently written, the CCPA will likely impact our business activities and exemplifies the vulnerability of our business to not only cyber threats but also the evolving regulatory environment related to personal data and protected health information.

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 significant 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, 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.

Additionally, in the United States and some foreign jurisdictions there have been, and continue to be, several legislative and regulatory changes and proposed reforms of the healthcare system in an effort to contain costs, improve quality, and expand access to care. These reform initiatives may, among other things, result in modifications to the aforementioned laws and/or the implementation of new laws affecting the healthcare industry. Similarly, a significant trend in the healthcare industry is cost containment. Third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for particular medications. Our ability to commercialize any of our products successfully will depend in part on the extent to which coverage and adequate reimbursement for these products and will be available from third-party payors.

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 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 may enter into additional license agreements in the future. Our existing license agreement imposes, and future license agreements may 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.

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.

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 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.

Risks related to ownership of our common stock

If we fail to satisfy applicable listing standards, our common stock may be delisted from the Nasdaq Global Select Market.

On October 28, 2019, we received a letter from the Listing Qualifications Staff of the Nasdaq Stock Market LLC, or Nasdaq, notifying us that the closing bid price of our common stock had been below $1.00 per share for 30 consecutive business days and that we were therefore not in compliance with the minimum bid price requirement for continued listing on The Nasdaq Global Select Market, as required by Nasdaq Listing Rule 5550(a)(2). Nasdaq stated in its October 28, 2019 letter that, in accordance with Nasdaq Listing 5810(c)(3)(A), we have a grace period of 180 calendar days, or until April 27, 2020, to regain compliance with the minimum closing bid price requirement for continued listing. We will regain compliance if our closing bid price is at or above $1.00 for at least 10 consecutive business days anytime during the 180-day grace period.

There is no guarantee that we will be able to regain compliance with the Nasdaq minimum bid price requirement, which could result in Nasdaq taking steps to delist our common stock. Delisting from The Nasdaq Global Select Market could adversely affect our ability to raise additional financing through the public or private sale of equity securities, would significantly affect the ability of investors to trade our securities and would negatively affect the value and liquidity of our common stock. Delisting could also have other negative results, including the potential loss of confidence by employees, the loss of institutional investor interest and fewer business development opportunities. If our common stock is delisted by The Nasdaq Global Select Market, the price of our common stock may decline, and although our common stock may be eligible to trade on the Nasdaq Capital Market, the OTC Bulletin Board, another over-the-counter quotation system, or on the pink sheets, an investor may find it more difficult to dispose of their common stock or obtain accurate quotations as to the market value of our common stock. Further, if we are delisted, we would incur additional costs under state blue sky laws in connection with any sales of our securities. These requirements could severely limit the market liquidity of our common stock and the ability of our shareholders to sell our common stock in the secondary market.

In addition, we are required pursuant to the terms of the Merger Agreement to submit to our stockholders a proposal to approve an amendment to our restated certification of incorporate to authorize our board of directors to effect a reverse stock split of all outstanding shares of our common stock. The approval of the reverse stock split by the stockholders is a condition to closing, pursuant to the Merger Agreement. If this reverse stock split proposal is not approved by our stockholders, and if the parties waive this closing condition, the combined company resulting from the proposed Merger will likely not be able to obtain compliance with the minimum bid price requirement for an initial listing on The Nasdaq Capital Market and, as a consequence, Nasdaq will immediately provide the combined company with written notification that our common stock will be delisted.

If our common stock is delisted, we would expect our common stock to be traded in the over-the-counter market, which could adversely affect the liquidity of our common stock. Additionally, we could face significant material adverse consequences, including:

- a limited availability of market quotations for our common stock;
- a reduced amount of news and analyst coverage for us;
- a decreased ability to issue additional securities and a concomitant substantial impairment in our ability to obtain sufficient additional capital to fund our operations and to continue as a going concern;
- reduced liquidity for our stockholders;
- potential loss of confidence by employees and potential future partners or collaborators; and
- loss of institutional investor interest and fewer business development opportunities.

The market price of our common stock has been volatile and may continue to be volatile in the future. This volatility may cause our stock price and the value of your investment to decline.

The market prices for securities of biotechnology companies, including ours, have been highly volatile and may continue to be so in the future. In this regard, the market price for our common stock has varied between a high of $12.00 on March 5, 2019, and a low of $0.42 on December 18, 2019, in the twelve-month period ended December 31, 2019. The market price of our common stock is likely to continue to be volatile and subject to significant price and volume fluctuations. 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.

In the past, class action litigation has often been instituted against companies whose securities have experienced periods of volatility in market price. Any such litigation brought against us could result in substantial costs, which would hurt our financial condition and results of operations.

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

From time to time, global credit and financial markets have experienced extreme volatility and disruptions, including severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates and uncertainty about economic stability. Our general business strategy may be adversely affected by any such economic downturn, volatile business environment and continued unpredictable and unstable market conditions. If the equity and credit markets deteriorate it may make any necessary debt or equity financing more difficult to complete, 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 an economic down-turn, 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 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 Jumpstart Our Business Startups Act, or 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 (i.e. December 31, 2022), (b) in which we have total annual gross revenue of at least $1.07 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.

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 had 23,899,261 shares of common stock outstanding as of February 21, 2020. 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 other stockholders to sell shares of our common stock. In addition, as of December 31, 2019, 4,944,733 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.

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 stockholders do not have the opportunity 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. Management might not apply working capital in ways that ultimately increase stockholder value. Failure by us to apply 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.

Changes in tax laws or regulations that are applied adversely to us or our customers may have a material adverse effect on our business, cash flow, financial condition or results of operations.

New income, sales, use or other tax laws, statutes, rules, regulations or ordinances could be enacted at any time, which could affect the tax treatment of our domestic and foreign earnings. Any new taxes could adversely affect our domestic and international business operations, and our business and financial performance. Further, existing tax laws, statutes, rules, regulations or ordinances could be interpreted, changed, modified or applied adversely to us. For example, legislation enacted in 2017, informally titled the Tax Cuts and Jobs Act, or Tax Act, made many significant changes to the tax laws, including the Internal Revenue Code of 1986, as amended, or IRC. Future guidance from the Internal Revenue Service and other tax authorities with respect to the Tax Act may affect us, and certain aspects of the Tax Act could be repealed or modified in future legislation. In addition, it is uncertain if and to what extent various states will conform to the Tax Act or any newly enacted federal tax legislation. Changes in corporate tax rates, the realization of net deferred tax assets relating to our operations, the taxation of foreign earnings, and the deductibility of expenses under the Tax Act or future reform legislation could have a material impact on the value of our deferred tax assets, could result in significant one-time charges, and could increase our future U.S. tax expense.

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

As of December 31, 2019, we had federal net operating losses of $231.0 million, of which $136.6 million begin to expire in 2028 unless previously utilized and $94.4 million do not expire but are limited to 80% of taxable income in a given year. As of December 31, 2019, we had state net operating loss carryforwards of $76.0 million that begin to expire in 2028 unless previously utilized. If these net operating loss carryforwards expire unused, they will be unavailable to offset future income and reduce future income tax liabilities. In addition, under the Tax Act, federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal net operating losses is limited. It is uncertain if and to what extent various states will conform to the Tax Act. Under Sections 382 and 383 of the IRC, 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 public offerings and multiple other rounds of financing since our inception which may have resulted in an ownership change or could result in one or more ownership changes in the future. As of December 31, 2019, 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.

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 choice of forum provisions do not apply to suits brought to enforce a duty or liability created by the Securities Act, the Exchange Act, or any other claim for which the federal courts have exclusive jurisdiction).

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; *provided*, that these choice of forum provisions do not apply to suits brought to enforce a duty or liability created by the Securities Act, the Exchange Act, or any other claim for which the federal courts have exclusive jurisdiction. 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 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

As of December 31, 2019, we leased a total of approximately 18,000 square feet of laboratory and office space located at 4242 Campus Point Court, Suite 600, San Diego, California, 92121.

We do not own any property, nor do we have any contracts or options to acquire any property in the future. Presently, we are operating out of a virtual office. This space is adequate for our present and our planned future operations. We have no current plans to lease or occupy other or additional office space.

Item 3. Legal Proceedings.

None.

Item 4. Mine Safety Disclosures.

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities.

Market Information

Our common stock began trading on the Nasdaq Global Select Market under the symbol "TOCA" on April 13, 2017. Prior to that date, there was no public trading market for our common stock.

Holders of Record

As of February 21, 2020, there were approximately 319 stockholders of record of our common stock. The actual number of stockholders is greater than this number of record holders and includes stockholders who are beneficial owners but whose shares are held in street name by brokers and other nominees. This number of holders of record also does not include stockholders whose shares may be held in trust or by other entities.

Dividend Policy

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all available funds and any future earnings for use in the operation of our business and do not anticipate paying any dividends on our common stock in the foreseeable future. Any future determination to declare dividends will be made at the discretion of our board of directors and will depend on, among other factors, our financial condition, operating results, capital requirements, contractual restrictions, general business conditions and other factors that our board of directors may deem relevant. In addition, the terms of our Loan Agreement prohibit us from paying cash dividends.

Securities Authorized for Issuance Under Our Equity Compensation Plans

Information regarding securities authorized for issuance under our equity compensation plans is incorporated herein by reference to Item 12, "Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters" of Part III of this Annual Report on Form 10-K.

Purchases of Equity Securities by the Issuer and Affiliated Purchasers

None.

Item 6. Selected Financial Data

None.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

You should read the following discussion and analysis of our financial condition and results of operations together with the section entitled "Selected Financial Data" and our financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. This discussion and analysis contains forward-looking statements based upon current expectations that involve risks and uncertainties. Our actual results may differ materially from those anticipated in these forward-looking statements as a result of various factors, including those discussed in the section entitled "Risk Factors" and in other parts of this Annual Report on Form 10-K. Please also see the section entitled "Special Note Regarding 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. Our 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. Our gene therapy approach is designed to fight cancer through immunotherapeutic mechanisms of action without the autoimmune toxicities commonly experienced with other immunotherapies.

We had been developing Toca 511 (vocimagene amiretrorepvec) & Toca FC (extended-release flucytosine), initially for the treatment of recurrent high grade glioma, or HGG, a brain cancer with limited treatment options, low survival rates and, therefore, a significant unmet medical need. We conducted a randomized, controlled Phase 3 clinical trial (Toca 5) of Toca 511 & Toca FC in patients with recurrent HGG, which was designed to serve as a registrational trial. At the final analysis, the trial missed the primary endpoint of overall survival compared to the standard of care treatment (11.1 months median compared to 12.2 months, HR=1.06, p=0.6154). In addition, all secondary endpoints showed no meaningful difference between the arms of the trial.

We do not have any products approved for sale and have not generated any revenue from product sales. Since our inception in August 2007, we have devoted substantially all of our efforts to developing our gene therapy platform and 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 $279.4 million as of December 31, 2019. 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 do not have any commitments for future external funding.

Following the announcement of the Toca 5 trial results, our board of directors commenced a process of evaluating strategic alternatives to maximize stockholder value. To assist with this process, our board of directors engaged a financial advisory firm to help explore our available strategic alternatives, including possible mergers and business combinations, a sale of part or all of our assets, and collaboration and licensing arrangements. On February 19, 2020, we and Forte announced the signing of the Merger Agreement. Upon the terms and subject to the satisfaction of the conditions described in the Merger Agreement, including approval of the transaction by our stockholders, a wholly-owned subsidiary of Tocagen will be merged with and into Forte, with Forte surviving the Merger as a wholly-owned subsidiary of Tocagen.

The proposed Merger is structured as a stock-for-stock transaction whereby all of Forte's outstanding shares of common stock and securities convertible into or exercisable for Forte's common stock will be converted into the right to receive Tocagen common stock and securities convertible into or exercisable for Tocagen common stock. Under the exchange ratio formula in the Merger Agreement, the former Forte equityholders immediately before the Merger are expected to own approximately 74.5% of the outstanding capital stock of Tocagen, and the equityholders of Tocagen immediately before the Merger are expected to own approximately 25.5% of the outstanding capital stock of Tocagen, on a fully diluted basis using the treasury stock method subject to certain assumptions. We anticipate that the Merger will close in the second quarter of 2020. This transaction, which has been approved by our board of directors and the board of directors of Forte, is subject to the satisfaction or waiver of certain conditions, including the required approvals by the parties' stockholders and other customary closing conditions. Certain affiliates of ours who hold approximately 6% of our common stock as of date of the Merger Agreement have agreed to vote in favor of the Merger and certain affiliates of Forte, who hold approximately 95% of the outstanding capital stock of Forte as of date of the Merger Agreement have agreed to vote in favor of the Merger.

Although we have entered into the Merger Agreement and intend to consummate the proposed Merger, there is no assurance that we will be able to successfully consummate the proposed Merger on a timely basis, or at all. If, for any reason, the proposed Merger is not completed, we will reconsider our strategic alternatives and could pursue one or more of the following courses of action:

- ***Pursue potential collaborative, partnering or other strategic arrangements for our assets, including a sale or other divestiture of our assets.*** We have discontinued further development of our programs, including Toca 511 & Toca FC, and do not currently have any plans to resume development of any of our development programs. We continue our efforts to seek potential collaborative, partnering or other strategic arrangements for our programs, including a sale or other divestiture of our assets.

- ***Pursue another strategic transaction like the proposed Merger.*** Our board of directors may elect to pursue an alternative strategy, one of which may be a strategic transaction similar to the proposed Merger.
- ***Dissolve and liquidate our assets.*** If, for any reason, the proposed Merger is not consummated and we are unable to identify and complete an alternative strategic transaction like the Merger or potential collaborative, partnering or other strategic arrangements for our assets, or to continue to operate our business due to our inability to raise additional funding, we may be required to dissolve and liquidate our assets. In such case, we would be required to pay all of our debts and contractual obligations, and to set aside certain reserves for potential future claims, and there can be no assurances as to the amount or timing of available cash left to distribute to our stockholders after paying our debts and other obligations and setting aside funds for reserves.

To conserve our cash resources, we have substantially reduced our workforce and have wound down and suspended our research and development activities. We are continuing to provide study drug for patients who remain on therapy via investigator sponsored trials (principal investigator assumes responsibility) through single patient INDs and are continuing our day-to-day business operations including the limited remaining activities required to wrap up the Toca 5 trial.

ATM Facility

In November 2018, we entered into an Equity Distribution Agreement with Citigroup Global Markets Inc., or Citigroup, pursuant to which we may sell and issue shares of our common stock having an aggregate offering price of up to $30,000,000 from time to time through Citigroup, as our sales agent, or the ATM facility. As of December 31, 2019, we sold 760,089 shares of our common stock under the ATM facility and received net proceeds of $7.7 million. Although we have approximately $23.3 million of shares of our common stock available for sale under this agreement, given our currently-depressed stock price, the ATM Facility is not expected to be a practical source of liquidity for us at this time. Further, given our currently-depressed stock price, we are significantly limited in our ability to sell shares of common stock under the ATM Facility since the issuance and sale of our common stock under the ATM Facility, if it occurs, would be effected under a registration statement on Form S-3 that we filed with the Securities and Exchange Commission, and in accordance with the rules governing those registration statements, we generally can only sell shares of our common stock under that registration statement in an amount not to exceed one-third of our public float, which limitation for all practical purposes precludes our ability to obtain any meaningful funding through the ATM Facility at this time.

Public Offering

In December 2018, we completed a public offering in which we sold an aggregate of 3,000,000 shares of common stock at a price of $10.00 per share. Net proceeds from the public offering, after deducting underwriting discounts, commissions and offering expenses, were approximately $28.0 million.

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.

We expect that any future 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 non-cash 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.

The following table sets forth our research and development expense by project for the years ended December 31, 2019, 2018 and 2017 (in thousands):

	Years Ended December 31,		
	2019	2018	2017
Toca 511 & Toca FC	$ 43,252	$ 46,872	$ 27,471
Vector technology	2,047	4,208	1,642
Total	$ 45,299	$ 51,080	$ 29,113

General and Administrative Expenses

General and administrative expenses consist primarily of salaries and related expenses for personnel, including non-cash 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, information technology, insurance, professional fees for accounting and legal services, expenses associated with obtaining and maintaining patents, expenses related to commercial readiness activities and costs associated with being a public company.

We anticipate continued 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 costs associated with being a public company.

Interest Income

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

Interest Expense

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

Income tax expense

Income tax expense consists primarily of foreign income tax expense incurred related to our License Agreement with ApolloBio.

Loss on disposal of assets

Loss on disposal of assets consists primarily of fixed assets which were either sold or disposed of as part of our reduction in lab and office space.

Gain on lease modification

Gain on lease modification consists of adjustments made to our right-of-use asset and lease liability related to our First Amendment to our Lease Agreement.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our financial statements which we have prepared in accordance with generally accepted accounting principles in the United States. The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

While our significant accounting policies are described in more detail in the Note 2 to our financial statements appearing at the end of this Annual Report on Form 10-K, we believe the following accounting policies to be most critical for fully understanding and evaluating our financial condition and results of operations.

Revenue Recognition

Revenue generally consists of license revenue with upfront payments and development milestones considered probable of achievement.

Revenue is recognized when control of the promised goods or services is transferred to our customers in an amount that reflects the consideration we expect to receive from customers in exchange for those goods and services. This process involves identifying the contract with a customer, determining the performance obligations in the contract, determining the transaction price, allocating the contract price to the distinct performance obligations in the contract, and recognizing revenue when or as we satisfy the performance obligation(s).

At contract inception, we assess the goods and services promised within each contract and assesses whether each promised good or service is distinct and determine whether those are performance obligations. A performance obligation is considered distinct from other obligations in a contract when it provides a benefit to the customer either on its own or together with other resources that are readily available to the customer and is separately identified in the contract. We consider factors such as the research, manufacturing and commercialization capabilities of the collaboration partner and the availability of the associated expertise in the general marketplace. We consider a performance obligation satisfied once we have transferred control of a good or service to the customer, meaning the customer has the ability to use and obtain the benefit of the good or service. We recognize revenue for satisfied performance obligations only when we determine there are no uncertainties regarding payment terms or transfer of control.

Collaborative Arrangements

We enter into collaborative arrangements with partners that may include payment to us of one or more of the following: (i) license fees; (ii) payments related to the achievement of developmental, regulatory, or commercial milestones; and (iii) royalties on net sales of licensed products. Where a portion of non-refundable upfront fees or other payments received are allocated to continuing performance obligations under the terms of a collaborative arrangement, they are recorded as contract liabilities and recognized as revenue when (or as) the underlying performance obligation is satisfied.

As part of the accounting for these arrangements, we must develop estimates and assumptions that require judgment to determine the underlying stand-alone selling price for each performance obligation which determines how the transaction price is allocated among the performance obligation(s). The stand-alone selling price may include items such as forecasted revenues, development timelines, discount rates, and probabilities of technical and regulatory success. We evaluate each performance obligation to determine if it can be satisfied at a point in time or over time. In addition, variable consideration must be evaluated to determine if it is constrained and, therefore, excluded from the transaction price.

License Fees

If a license to our intellectual property is determined to be distinct from the other performance obligations identified in the arrangement, we recognize revenue from non-refundable, upfront fees allocated to the license when the license is transferred to the licensee and the licensee is able to use and benefit from the license. For licenses that are bundled with other promises, we utilize judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue. We evaluate the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition. Any such adjustments are recorded on a cumulative catch-up basis, which would affect license, collaboration or other revenues and earnings in the period of adjustment.

Milestone Payments

At the inception of each arrangement that includes milestone payments (variable consideration), we evaluate whether the milestones are considered probable of being reached and estimates of the amount to be included in the transaction price. If it is probable that a milestone event would occur at the inception of the arrangement, the associated milestone value is included in the transaction price. Milestone payments that are not within our control, such as regulatory approvals, are generally not considered probable of being achieved until those approvals are received. The transaction price is then allocated to each performance obligation on a relative stand-alone selling price basis, for which we recognize revenue as or when the performance obligations under the contract are satisfied. At the end of each reporting period, we evaluate the probability of achievement of such milestones and any related constraint(s), and if necessary, may adjust our estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect license, collaboration or other revenues and earnings in the period of adjustment.

Royalties

For arrangements that include sales-based royalties, including milestone payments based on the level of sales, and for which the license is deemed to be the predominant item to which the royalties relate, we recognize revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, we have not recognized any royalty revenue resulting from collaborative arrangements.

Clinical Trial Accruals

Expenses related to clinical studies are based on estimates of the services received and efforts expended pursuant to our 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 our 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. We make estimates of our 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, we estimate 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 our estimate, we adjust the accrual or prepaid expense balance accordingly. Historically, our estimated accrued liabilities have materially approximated actual expense incurred.

Recent Accounting Pronouncements

We have reviewed all recently issued standards and have determined that other than as disclosed in Note 2 to our financial statements included in this Annual Report on Form 10-K, 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 Years Ended December 31, 2019 and 2018

The following table summarizes our results of operations for the years ended December 31, 2019 and 2018 (in thousands):

	Years Ended December 31,		Increase
	2019	2018	(Decrease)
License revenue	$ 36	$ 18,036	$ (18,000)
Research and development expenses	45,299	51,080	(5,781)
General and administrative expenses	16,248	12,809	3,439
Interest income	1,564	1,534	30
Interest expense	(3,820)	(2,930)	(890)
Loss on disposal of assets	(1,187)	(7)	(1,180)
Gain on lease modification	1,439	—	1,439
Income tax expense	1	1,699	(1,698)

License revenue License revenue was less than $0.1 million for the year ended December 31, 2019 as compared to $18.0 for the year ended December 31, 2018, a decrease of $18.0 million. Under the License Agreement with ApolloBio, we recognized a $16.0 million upfront payment and a $2.0 million development milestone payment for the year ended December 31, 2018.

Research and development expenses Research and development expenses were $45.3 million for the year ended December 31, 2019, as compared to $51.1 million for the year ended December 31, 2018. The decrease of $5.8 million was primarily due to a decrease in clinical trial related costs related to our Phase 3 Toca 5 clinical trial, which completed enrollment in 2018 and final analysis in October 2019. We recorded $0.8 million of severance related charges in connection with the Company's restructuring in 2019.

General and administrative expenses General and administrative expenses were $16.2 million for the year ended December 31, 2019, as compared to $12.8 million for the year ended December 31, 2018. The increase of $3.4 million was primarily due to an increase in commercial third party costs in anticipation of a potential product launch related to our Phase 3 clinical trial and an increase in personnel related costs, including non-cash stock based compensation. We recorded $0.1 million of severance related charges in connection with the Company's restructuring in 2019.

Interest income Interest income was $1.6 million for the year ended December 31, 2019, as compared to $1.5 million for the year ended December 31, 2018. Cash is invested and earning interest dependent on the Company's liquidity needs.

Interest expense Interest expense was $3.8 million for the year ended December 31, 2019, as compared to $2.9 million for the year ended December 31, 2018. The increase of $0.9 million year over year was due to a higher loan balance throughout 2019 compared to 2018.

Loss on disposal of assets Loss on disposal of assets was $1.2 million for the year ended December 31, 2019, as compared to less than $0.1 million for the year ended December 31, 2018. The 2019 activity was due to equipment sales in connection with the reduction in lab and office space in December 2019.

Gain on lease modification Gain on lease modification was $1.4 million for the year ended December 31, 2019, as compared to zero for the year ended December 31, 2018. The 2019 gain was due to the reduction in lab and office lease commitments in December 2019 in connection with the Company's restructuring.

Income tax expense Income tax expense of $1.7 million recorded for the year ended December 31, 2018 was due to foreign income tax expense paid in conjunction with our License Agreement with ApolloBio.

Comparison of the Years Ended December 31, 2018 and 2017

The following table summarizes our results of operations for the years ended December 31, 2018 and 2017 (in thousands):

	Years Ended December 31,		Increase
	2018	2017	(Decrease)
License revenue	$ 18,036	$ 41	$ 17,995
Research and development expenses	51,080	29,113	21,967
General and administrative expenses	12,809	8,556	4,253
Interest income	1,534	595	939
Interest expense	(2,930)	(1,932)	(998)
Income tax expense	1,699	1	1,698

License revenue License revenue was $18.0 million for the year ended December 31, 2018 as compared to $41,000 for the year ended December 31, 2017, an increase of $18.0 million. Under the License Agreement with ApolloBio, we recognized a $16.0 million upfront payment and a $2.0 million development milestone payment for the year ended December 31, 2018.

Research and development expenses Research and development expenses were $51.1 million for the year ended December 31, 2018, as compared to $29.1 million for the year ended December 31, 2017. The increase of $22.0 million was primarily due to increases in manufacturing and clinical trial costs of $15.3 million to support our Phase 3 clinical trial which completed enrollment in September 2018 and increased personnel costs, including non-cash stock-based compensation of $3.0 million due to an increase in headcount.

General and administrative expenses General and administrative expenses were $12.8 million for the year ended December 31, 2018, as compared to $8.6 million for the year ended December 31, 2017. The increase of $4.3 million was primarily due to increased personnel costs, including non-cash stock based compensation, of $1.0 million, a $1.1 million non-income tax expense related to the ApolloBio License Agreement and an increase in facility related expense due to our lab and office space lease which was signed in 2018 and increases in external service costs associated with the growth of our business and other costs associated with general business activities.

Interest income Interest income was $1.5 million for the year ended December 31, 2018, as compared to $0.6 million for the year ended December 31, 2017. The increase of $0.9 million was primarily due to our higher average cash balances earning interest at higher rates during 2018 compared to 2017.

Interest expense Interest expense was $2.9 million for the year ended December 31, 2018, as compared to $1.9 million for the year ended December 31, 2017 related to our outstanding debt. Our debt principal balance and exit fees increased in 2018 associated with refinancing our debt agreements.

Income tax expense Income tax expense of $1.7 million recorded for the year ended December 31, 2018 was due to foreign income tax expense paid in conjunction with our License Agreement with ApolloBio.

Liquidity and Capital Resources

We have incurred significant losses and cumulative negative cash flows from operations since our inception. As of December 31, 2019, we had an accumulated deficit of $279.4 million and we anticipate that we will continue to incur operating losses for the foreseeable future.

Based on our operating plans, cash, cash equivalents and marketable securities may not be sufficient to fund operations for the next 12 months. As a result, there is substantial doubt about our ability to continue as a going concern. All amounts due under the Term Loans (as defined below) have been classified as a current liability as of December 31, 2019 due to the assessment that a material adverse change clause under the Term Loans is not within our control. On October 31, 2019, we entered into an amendment, or the Second Amendment, to our Loan Agreement and made a prepayment of $23.3 million, which amount was used to prepay i) a portion equal to $21.5 million of the outstanding principal of the Term Loans plus all accrued and unpaid interest thereon through the prepayment date, ii) prorated portion of the final payment with respect to the portion of such Term Loans being prepaid, plus iii) all outstanding lenders' expenses as of the date of the Second Amendment. We have not been notified of an event of default by the Lender as of the date of the filing of this Form 10-K.

If we are unable to maintain sufficient financial resources, our business, financial condition and results of operations will be materially and adversely affected.

Since inception through December 31, 2019, we have funded our operations primarily through the private placement of our convertible preferred stock, our initial public offerings of our common stock, term loans, the issuance of our convertible promissory notes payable, and upfront and milestone payments under our license and collaboration agreements.

The loans under our amended and restated loan and security agreement with two lenders, dated May 18, 2018, as amended, or the Loan Agreement, 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). As of December 31, 2019, there was $5.0 million principal outstanding under the Loan Agreement. Balances under the Loan Agreement accrue interest at the prime rate plus 3.75%, subject to a floor of 8.50%. The interest rate as of December 31, 2019 was 9.00%. The loans under the Loan Agreement mature in December 2022 with interest only payments through January 1, 2020 followed by 36 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 December 31, 2019, we had $21.8 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.

Cash Flows

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

	Years Ended December 31,		
	2019	2018	2017
Net cash provided by (used in):			
Operating activities	$ (59,238)	$ (34,469)	$ (31,133)
Investing activities	42,319	(4,190)	(27,707)
Financing activities	(14,908)	43,539	89,263
Net (decrease) increase in cash and cash equivalents	$ (31,827)	$ 4,880	$ 30,423

Operating Activities Net cash used in operating activities was $59.2 million for the year ended December 31, 2019, and consisted primarily of a net loss of $63.5 million adjusted for a net decrease in cash from operating assets and liabilities of $6.3 million and a gain on lease modification of $1.4 million, offset by noncash stock-based compensation expense of $8.1 million, depreciation expense of $0.8 million, noncash interest expense of $1.7 million and loss on disposal of assets of $1.2 million. The $6.3 million net decrease in cash from operating assets and liabilities is due primarily to a $9.0 million decrease in our accounts payable and accrued liabilities offset by a $2.5 million decrease in prepaid expenses and other assets resulting mainly from shut down activities related to our clinical trial.

Net cash used in operating activities was $34.5 million for the year ended December 31, 2018, and consisted primarily of a net loss of $49.0 million adjusted for a net increase in cash from operating assets and liabilities of $6.1 million, noncash stock-based compensation expense of $6.9 million, depreciation expense of $0.6 million and noncash interest expense of $1.2 million. The $6.1 million net increase in cash from operating assets and liabilities is due primarily to a $5.4 million increase in our accounts payable and accrued liabilities resulting mainly from increases in clinical and manufacturing costs incurred to support our clinical trials and increases in our deferred rent of $1.0 million, offset by a $0.2 million increase in prepaid expenses related to our clinical trial costs.

Net cash used in operating activities was $31.1 million for the year ended December 31, 2017, and consisted primarily of a net loss of $38.9 million adjusted for a net increase in cash from operating assets and liabilities of $2.5 million, noncash stock-based compensation expense of $4.5 million, depreciation expense of $0.3 million and noncash interest expense of $0.6 million. The $2.5 million net increase in cash from operating assets and liabilities is due primarily to a $3.3 million increase in our accounts payable and accrued liabilities resulting mainly from increases in clinical and manufacturing costs incurred to support our clinical trials and increased accrued payroll and related liabilities, primarily offset by a $0.7 million increase in prepaid expenses related to our clinical trial costs.

Investing Activities Net cash provided by investing activities for the year ended December 31, 2019 was $42.3 million and primarily consisted of proceeds from the maturity of marketable securities of $93.5 million offset by purchases of marketable securities of $51.2 million and the purchase of property and equipment of $0.4 million. As there is substantial doubt about our ability to continue as a going concern, we are currently not reinvesting maturities of marketable securities.

Net cash used in investing activities for the year ended December 31, 2018 was $4.2 million and consisted of purchases of marketable securities of $70.8 million and purchases of property and equipment of $2.0 million, offset by sales and maturities of marketable securities of $68.5 million.

Net cash used in investing activities for the year ended December 31, 2017 was $27.7 million and consisted primarily of purchases of marketable securities of $70.8 million and purchases of property and equipment of $0.7 million offset by proceeds received from the sale and maturities of marketable securities of $43.7 million.

Financing activities Net cash used in financing activities for the year ended December 31, 2019 was $14.9 million and consisted primarily of $23.2 million in principal payments related to our loan and security agreement offset by $7.7 million in net proceeds from the issuance of shares under our ATM facility.

Net cash provided by financing activities for the year ended December 31, 2018 was $43.5 million and consisted primarily of net proceeds from the issuance of notes payable of $26.3 million in May, upon refinancing our original debt agreement and net proceeds received from the sale of common stock of $28.0 million ($0.2 million of offering costs accrued as of December 31, 2018), offset by $11.6 million in principal and extinguishment payments on our original notes payable in conjunction with our May 2018 refinancing.

Net cash provided by financing activities for the year ended December 31, 2017 was $89.3 million and consisted of 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, offset by $7.2 million in principal payments on our notes payable.

Funding Requirements

Our primary uses of capital are compensation and related expenses for personnel, third-party clinical research and development services, and general and administrative expenses. Based on our operating plans, cash, cash equivalents and marketable securities may not be sufficient to fund operations for the next 12 months. As a result, there is substantial doubt about our ability to continue as a going concern. All amounts due under the Term Loans have been classified as a current liability as of December 31, 2019 due to the assessment that a material adverse change clause under the Term Loans is not within our control. On October 31, 2019, we entered into the Second Amendment and made a prepayment of $23.3 million, which amount was used to prepay i) a portion equal to $21.5 million of the outstanding principal of the Term Loans plus all accrued and unpaid interest thereon through the prepayment date, ii) prorated portion of the final payment with respect to the portion of such Term Loans being prepaid, plus iii) all outstanding lenders' expenses as of the date of the Second Amendment. We have not been notified of an event of default by the Lender as of the date of the filing of this Form 10-K.

If, for any reason, the proposed Merger is not consummated and we are unable to identify and complete an alternative strategic transaction like the Merger or potential collaborative, partnering or other strategic arrangements for our assets, or to continue to operate our business due to our inability to raise additional funding, we may be required to dissolve and liquidate our assets. In such case, we would be required to pay all of our debts and contractual obligations, and to set aside certain reserves for potential future claims, and there can be no assurances as to the amount or timing of available cash left to distribute to our stockholders after paying our debts and other obligations and setting aside funds for reserves.

Off-Balance Sheet Arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements, as defined in the rules and regulations of the SEC.

Contractual Obligations and Commitments

The following table summarizes our contractual obligations and commitments as of December 31, 2019 that will affect our future liquidity (in thousands):

	Total	2020 <1 Year	2021-2022 2-3 Years	2023-2024 4-5 Years	> 5 Years
Notes payable	$ 5,398	$ 1,667	$ 3,731	$ —	$ —
Operating lease obligation	6,310	882	1,858	1,990	1,580
Total	$ 11,708	$ 2,549	$ 5,589	$ 1,990	$ 1,580

We also have obligations under license, collaboration and various grant agreements to make future payments to third parties that become due and payable on the achievement of certain commercial milestones. We have not included these commitments on our balance sheet or in the table above because the achievement and timing of these events is not fixed and determinable. These commitments are listed as follows:

- Pursuant to the technology license agreement with the University of Southern California, or USC, we are obligated to pay an annual royalty to USC starting in the second full calendar year when the net sales of products using the technology covered by the agreement reach a mid-seven-digit dollar range and until such time that the last valid claim of the patents covering our products expires. We are subject to pay interest if and when we become delinquent in our royalty payments.
- Pursuant to the collaborative agreement with Siemens, we are obligated to pay Siemens a royalty amount up to the mid-nine-digit dollar range per year on our brain cancer product sales in the first five years of such commercial sales.
- Pursuant to the agreement for a grant we received from Accelerate Brain Cancer Cure, Inc., or ABC2, we are obligated to pay an amount up to a maximum of $0.2 million to ABC2 if and when the net sales of our initial product candidate reach a total of $5.0 million within 10 years of the grant date. In addition, the ABC2 grant includes a conversion option whereby the payment amount may be converted, at our option, to common stock under certain circumstances.
- Pursuant to the agreement for a grant we received from the American Brain Tumor Association, or ABTA, we are obligated to pay an amount up to a maximum of $0.2 million to ABTA if and when the net sales of our initial product candidate reach a total of $5.0 million within 10 years of the ABTA grant date.

We enter into contracts in the ordinary course of business with clinical sites for the conduct of clinical trials, service providers for product manufacture and preclinical research studies, professional consultants for expert advice and other vendors for laboratory and research supplies and services. These contracts generally provide for termination on notice, and therefore are cancelable contracts and not included in the table of contractual obligations and commitments. In addition, these contracts have indemnification clause whereby we indemnify, defend, hold harmless and agree to reimburse the indemnified party for losses suffered or incurred by third party claims arising out of the indemnified party's performance of service. We have not incurred costs to defend lawsuits or settle claims related to these indemnification clauses.

Item 7A. 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 December 31, 2019, we had cash, cash equivalents and marketable securities of $21.8 million consisting of cash and investments in certificates of deposit, money market funds, and investment-grade fixed income 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.

We also have interest rate exposure as a result of our Loan Agreement. As of December 31, 2019, the outstanding principal amount under the Loan Agreement was $5.0 million. The term loan bears interest at a floating per annum rate equal to the greater of (i) 8.50% and (ii) the sum of (a) the prime rate reported in the Wall Street Journal on the last business day of the month that

immediately proceeds the month in which the interest will accrue, plus (b) 3.75%. Changes in the U.S. Dollar prime rate may therefore affect our interest expense associated with the term loan.

If a 10% change in interest rates were to have occurred on December 31, 2019, this change would not have had a material effect on our interest expense as of that date.

Item 8. Financial Statements and Supplementary Data.

The financial statements and supplementary data required by this item are included after the Signatures page of this Annual Report on Form 10-K beginning on page F-1.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.

None.

Item 9A. Controls and Procedures.

Disclosure Controls and Procedures

We maintain disclosure controls and procedures that are designed to provide reasonable assurance that information required to be disclosed in our periodic and current reports that we file with the SEC is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and that such information is accumulated and communicated to our management, including our principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure. In designing and evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable and not absolute assurance of achieving the desired control objectives. In reaching a reasonable level of assurance, management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures. In addition, the design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected.

As of December 31, 2019, we carried out an evaluation under the supervision and with the participation of our management, including our principal executive officer and our principal financial officer, of the effectiveness of the design and operation of our disclosure controls and procedures, as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended, or Exchange Act. Based on this evaluation, our principal executive officer and principal financial officer concluded that our disclosure controls and procedures were effective at the reasonable assurance level as of December 31, 2019.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting as such term as defined in Exchange Act Rule 13a-15(f). Internal control over financial reporting is a process designed under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with accounting principles generally accepted in the United States of America.

As of December 31, 2019, our management assessed the effectiveness of our internal control over financial reporting using the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission in *Internal Control-Integrated Framework (2013 Framework).* Based on this assessment, our management concluded that, as of December 31, 2019, our internal control over financial reporting was effective based on those criteria.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting that occurred during the most recent fiscal quarter ended December 31, 2019 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information.

On February 21, 2020, we entered into (i) a Second Amended and Restated Executive Employment Agreement with Martin Duvall, our Chief Executive Officer, or the Duvall Agreement, (ii) a Second Amended and Restated Executive Employment Agreement with Mark Foletta, our Executive Vice President, Chief Financial Officer, the Foletta Agreement, and (iii) an Amended and Restated Executive Employment Agreement with Douglas Jolly, Ph.D., our Executive Vice President, Research and Pharmaceutical Development, or the Jolly Agreement, and, together with the Duvall Agreement and the Foletta Agreement, the Employment Agreements.

The Duvall Agreement supersedes all other or prior agreements with respect to Mr. Duvall's employment terms, including the Amended and Restated Employment Agreement, dated February 12, 2018, by and between us and Mr. Duvall. Mr. Duvall's employment under the Duvall Agreement is at will and may be terminated at any time by us or him. Pursuant to the Duvall Agreement, Mr. Duvall is entitled to: (i) an annual base salary of $515,000 and (ii) a discretionary annual bonus of up to 50% of Mr. Duvall's base salary, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee. If we terminate Mr. Duvall's employment without cause (other than due to his death or disability) or if Mr. Duvall resigns for good reason at any time, or collectively, an Involuntary Termination, Mr. Duvall is entitled to receive (A) severance payments in the form of continuation of his base salary then in effect (ignoring any decrease that forms the basis for his resignation for good reason, if applicable) for 18 months, (B) continued health insurance coverage under our group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent until the earliest of (1) the end of the 18 month severance period, (2) the expiration of his eligibility for the continuation coverage, or (3) the date when he becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment and (C) an extension of the period of time following which he may exercise vested shares subject to outstanding equity awards until the date that is the earlier of the original expiration date of such award and 18 months following such Involuntary Termination, or the Duvall Severance Benefits. Additionally, in the event of an Involuntary Termination at any time during the time period commencing three months prior to or 12 months after the effective date of a change in control of us, Mr. Duvall is entitled to receive full vesting acceleration of all shares subject to time-based vesting stock awards then outstanding and held by Mr. Duvall, or the Duvall Change in Control Severance Benefits. The Duvall Severance Benefits and Duvall Change in Control Severance Benefits are conditioned upon Mr. Duvall signing and not revoking a general release of legal claims in the form provided by us.

The Foletta Agreement supersedes all other or prior agreements with respect to Mr. Foletta's employment terms, including the Amended and Restated Employment Agreement, dated February 12, 2018, by and between us and Mr. Foletta. Mr. Foletta's employment under the Foletta Agreement is at will and may be terminated at any time by us or him. Pursuant to the Foletta Agreement, Mr. Foletta is entitled to: (i) an annual base salary of $390,000 and (ii) a discretionary annual bonus of up to 40% of Mr. Foletta's base salary, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee. In the event of an Involuntary Termination of Mr. Foletta, Mr. Foletta is entitled to receive (A) severance payments in the form of continuation of his base salary then in effect (ignoring any decrease that forms the basis for his resignation for good reason, if applicable) for 12 months, (B) continued health insurance coverage under our group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent until the earliest of (1) the end of the 12 month severance period, (2) the expiration of his eligibility for the continuation coverage, or (3) the date when he becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment and (C) an extension of the period of time following which he may exercise vested shares subject to outstanding equity awards until the date that is the earlier of the original expiration date of such award and 12 months following such Involuntary Termination, or the Foletta Severance Benefits. Additionally, in the event of an Involuntary Termination at any time during the time period commencing three months prior to or 12 months after the effective date of a change in control of us, Mr. Foletta is entitled to receive full vesting acceleration of all shares subject to time-based vesting stock awards then outstanding and held by Mr. Foletta, or the Foletta Change in Control Severance Benefits. The Foletta Severance Benefits and Foletta Change in Control Severance Benefits are conditioned upon Mr. Foletta signing and not revoking a general release of legal claims in the form provided by us.

The Jolly Agreement supersedes all other or prior agreements with respect to Dr. Jolly's employment terms, including the Employment Agreement, dated February 12, 2018, by and between us and Dr. Jolly. Dr. Jolly's employment under the Jolly Agreement is at will and may be terminated at any time by us or him. Pursuant to the Jolly Agreement, Dr. Jolly is entitled to: (i) an annual base salary of $300,000 and (ii) a discretionary annual bonus of up to 40% of Dr. Jolly's base salary, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee. In the event of an Involuntary Termination of Dr. Jolly, Dr. Jolly is entitled to receive (A) severance payments in the form of continuation of his base salary then in effect (ignoring any decrease that forms the basis for his resignation for good reason, if applicable) for nine months and (B) continued health insurance coverage under our group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent until the earliest of (1) the end of the nine month severance period, (2) the expiration of his eligibility for the continuation coverage, or (3) the date when he becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment, or the Jolly Severance Benefits. Additionally, in the event of an Involuntary Termination at any time during the time period commencing three months prior

to or 12 months after the effective date of a change in control of us, Dr. Jolly is entitled to receive full vesting acceleration of all shares subject to time-based vesting stock awards then outstanding and held by Dr. Jolly, or the Jolly Change in Control Severance Benefits. The Jolly Severance Benefits and Jolly Change in Control Severance Benefits are conditioned upon Dr. Jolly signing and not revoking a general release of legal claims in the form provided by us.

The foregoing summary of the Employment Agreements does not purport to be complete and is qualified in its entirety by reference to the complete Employment Agreements, copies of which are On February 21, 2020, we entered into Amended and Restated Executive Employment Agreements ("Amended Agreements") with Martin Duvall, our Chief Executive Officer, Mark Foletta, our Executive Vice President, Chief Financial Officer, Douglas Jolly, Ph.D., our Executive Vice President, Research and Pharmaceutical Development and Fairooz Kabbinavar, our Senior Vice President, Clinical Development. Such Amended Agreements supersede all prior Employment Agreements between us and the named executive officer. Such Amended Agreements are filed herewith as exhibits to our Annual Report on Form 10-K.

On February 21, 2020, as part of our corporate restructuring plan, Martin Duvall, our Chief Executive Officer and Mark Foletta, our Executive Vice President, Chief Financial Officer were notified that their employment with us will end upon the closing of the proposed Merger with Forte.

On February 26, 2020, Harry Gruber, M.D. resigned from our Board of Directors, effective immediately.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

The information required by this item and not set forth below will be contained in our definitive proxy statement to be filed with the Securities and Exchange Commission in connection with our 2020 Annual Meeting of Stockholders, or the Proxy Statement, which is expected to be filed not later than 120 days after the end of our fiscal year ended December 31, 2019, and is incorporated herein by reference.

We have adopted a written Code of Business Conduct and Ethics, or Ethics Code, that applies to all officers, directors and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. The Ethics Code is available on our website at www.tocagen.com. If we make any substantive amendments to the Ethics Code or grant any waiver from a provision of the Ethics Code to any executive officer or director, we will promptly disclose the nature of the amendment or waiver on our website or in a current report on Form 8-K.

Item 11. Executive Compensation.

The information required by this item will be set forth in the Proxy Statement and is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

The information required by this item will be set forth in the Proxy Statement and is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this item will be set forth in the Proxy Statement and is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services.

The information required by this item will be set forth in the Proxy Statement and is incorporated herein by reference.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(a)(1) Financial statements:

The Financial Statements of Tocagen Inc. and Report of Independent Registered Public Accounting Firm are included after the Signatures page of this Annual Report on Form 10-K beginning on page F-1.

(a)(2) Financial Statement Schedules:

These schedules have been omitted because the required information is included in the financial statements or notes thereto or because they are not applicable or not required.

(a)(3) Exhibits

Exhibit Index

Exhibit Number	Description
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 on March 9, 2017.
4.2†*	Description of Common Stock.
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 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 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 on March 9, 2017.
4.6	Warrant to Purchase Common Stock, dated May 18, 2018, issued to Oxford Finance LLC, incorporated by reference to Exhibit 4.6 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
4.7	Warrant to Purchase Common Stock, dated May 18, 2018, issued to Oxford Finance LLC, incorporated by reference to Exhibit 4.7 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
4.8	Warrant to Purchase Common Stock, dated May 18, 2018, issued to Oxford Finance LLC, incorporated by reference to Exhibit 4.8 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
4.9	Warrant to Purchase Common Stock, dated May 18, 2018, issued to Silicon Valley Bank, incorporated by reference to Exhibit 4.9 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
10.1+	Form of Indemnity Agreement by and between the Registrant and its directors and officers, incorporated by reference to Exhibit 10.1 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed on March 9, 2017.
10.2+	Tocagen Inc. 2009 Equity Incentive Plan and Forms of Option Grant Notice, Option Agreement and Notice of Exercise thereunder, as amended, incorporated by reference to Exhibit 10.2 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed on March 9, 2017.
10.3+	Tocagen Inc. 2017 Equity Incentive Plan, as amended, and Forms of Stock Option Grant Notice, Option Agreement and Notice of Exercise thereunder, incorporated by reference to Exhibit 10.3 of the Registrant's Annual Report on Form 10-K filed on February 27, 2019.
10.4+	Tocagen Inc. 2017 Employee Stock Purchase Plan, incorporated by reference to Exhibit 10.4 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed on March 9, 2017.
10.5†	Laboratory Services and License Agreement, effective as of November 17, 2011, by and between the Registrant and Siemens Healthcare Diagnostics Inc., incorporated by reference to Exhibit 10.7 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed on March 9, 2017.
10.6†	First Amendment to Laboratory Services and License Agreement, effective as of June 19, 2015, by and between the Registrant and Siemens Healthcare Diagnostics Inc., incorporated by reference to Exhibit 10.8 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed on March 9, 2017.
10.7†	License Agreement, effective as of October 22, 2007, by and between the Registrant and University of Southern California, incorporated by reference to Exhibit 10.9 of the Registrant's Registration Statement on Form S-1 (File No. 333-216574), as amended, originally filed on March 9, 2017.
10.8	Tocagen Inc. Annual Incentive Plan, incorporated by reference to Exhibit 10.1 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2017.
10.9	Tocagen Inc. Amended and Restated Non-Employee Director Compensation Policy, incorporated by reference to Exhibit 10.11 of the Registrant's Annual Report on Form 10-K filed on March 9, 2018.
10.10+*	Amended and Restated Executive Employment Agreement, dated February 21, 2020, by and between the Registrant and Martin J. Duvall.
10.11+*	Amended and Restated Executive Employment Agreement, dated February 21, 2020, by and between the Registrant and Mark Foletta.

10.12+*	Amended and Restated Executive Employment Agreement, dated February 21, 2020, by and between the Registrant and Douglas Jolly, Ph.D.
10.13	Lease Agreement by and between the Registrant and AP3-SD1 Campus Point LLC, dated December 21, 2017, incorporated by reference to Exhibit 10.16 of the Registrant's Annual Report on Form 10-K filed on March 9, 2018.
10.14†	License Agreement, dated April 18, 2018, by and among the Registrant, Beijing Apollo Venus Biomedical Technology Limited and ApolloBio Corp., incorporated by reference to Exhibit 10.1 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
10.15	Amended and Restated Loan and Security Agreement, dated May 18, 2018, by and among the Registrant, Oxford Finance LLC and Silicon Valley Bank, incorporated by reference to Exhibit 10.2 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
10.16	First Amendment to Amended and Restated Loan and Security Agreement, dated August 3, 2018, by and amount the Registrant, Oxford Finance LLC and Silicon Valley Bank, incorporated by reference to Exhibit 10.3 of the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2018.
10.17+	Executive Employment Agreement, dated April 8, 2019, by and between the Registrant and Harry E. Gruber, M.D., incorporated by reference to Exhibit 10.1 of the Registrant's Quarterly Report on Form 10-Q filed on August 8, 2019.
10.18*	Form of Restricted Stock Unit Grant Notice and Agreement.
10.19	Consent and Second Amendment to Amended and Restated Loan and Security Agreement, dated October 31, 2019, by and among the Registrant, Oxford Finance LLC and Silicon Valley Bank, incorporated by reference to Exhibit 10.1 of the Registrant's Quarterly Report on Form 10-Q filed on November 12, 2019.
10.20*	First Amendment to Lease Agreement, dated December 16, 2019, by and between the Registrant and AP3-SD1 Campus Point LLC.
10.21+*	Amended and Restated Executive Employment Agreement, dated February 21, 2020, by and between the Registrant and Fairooz Kabbinavar M.D.
23.1*	Consent of Independent Registered Public Accounting Firm.
24.1*	Power of Attorney (included on signature page).
31.1*	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2*	Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Principal Executive Officer and Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
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 Label Linkbase Document

* Filed herewith.

\+ Indicates management contract or compensatory plan.

† Confidential treatment has been granted with respect to certain portions of this exhibit. Omitted portions have been filed separately with the Securities and Exchange Commission.

Item 16. Form 10–K Summary.

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized**.**

TOCAGEN INC.

Date: February 27, 2020

By: /s/ MARTIN J. DUVALL

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

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Martin J. Duvall and Mark Foletta, and each of them, as his or her true and lawful attorneys-in-fact, each with full power of substitution, for him or her in any and all capacities, to sign any amendments to this Annual Report on Form 10-K and to file the same, with exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, hereby ratifying and confirming all that each of said attorneys-in-fact or their substitute or substitutes may do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, this report has been signed below by the following persons on behalf of the registrant in the capacities and on the dates indicated.

Signature	Title	Date
/s/ Martin J. Duvall **Martin J. Duvall**	Chief Executive Officer and Member of the Board of Directors *(Principal Executive Officer)*	February 27, 2020
/s/ Mark Foletta **Mark Foletta**	Chief Financial Officer *(Principal Financial and Accounting Officer)*	February 27, 2020
/s/ Faheem Hasnain **Faheem Hasnain**	Chairman of the Board of Directors	February 27, 2020
/s/ Franklin M. Berger **Franklin M. Berger**	Member of the Board of Directors	February 27, 2020
/s/ Thomas E. Darcy **Thomas E. Darcy**	Member of the Board of Directors	February 27, 2020
/s/Lori Kunkel, M.D. **Lori Kunkel, M.D.**	Member of the Board of Directors	February 27, 2020
/s/ David Parkinson, M.D. **David Parkinson, M.D.**	Member of the Board of Directors	February 27, 2020
/s/ Paul Schimmel, Ph.D. **Paul Schimmel, Ph.D.**	Member of the Board of Directors	February 27, 2020

INDEX TO FINANCIAL STATEMENTS
TOCAGEN INC.

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Tocagen Inc.

Opinion on the Financial Statements
We have audited the accompanying balance sheets of Tocagen Inc. (the Company) as of December 31, 2019 and 2018, and the related statements of operations and comprehensive loss, changes in convertible preferred stock and stockholders' equity (deficit) and cash flows for each of the three years in the period ended December 31, 2019, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019, in conformity with U.S. generally accepted accounting principles.

The Company's Ability to Continue as a Going Concern
The accompanying financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 1 to the financial statements, the Company has suffered recurring losses from operations and has stated that substantial doubt exists about the Company's ability to continue as a going concern. Management's evaluation of the events and conditions and management's plans regarding these matters are also described in Note 1. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Adoption of ASU No. 2016-02
As discussed in Note 2 to the financial statements, the Company changed its method of accounting for leases in 2019 due to the adoption of Accounting Standards Update (ASU) No. 2016-02, Leases (Topic 842), and the related amendments.

Basis for Opinion
These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2008
San Diego, California
February 27, 2020

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

	December 31, 2019	December 31, 2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 8,986	$ 40,813
Marketable securities	12,835	55,273
Prepaid expenses and other current assets	1,135	1,662
Total current assets	22,956	97,748
Property and equipment, net	1,689	3,973
Operating lease right-of-use asset	3,515	—
Other assets	—	1,360
Total assets	$ 28,160	$ 103,081
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 3,218	$ 3,404
Accrued liabilities	5,242	13,094
Notes payable, current portion	4,744	—
Deferred license revenue	—	36
Total current liabilities	13,204	16,534
Operating lease liability, net of current portion	4,027	—
Notes payable, net of current portion	—	26,201
Deferred rent, net of current portion	—	2,201
Other long term liabilities	81	—
Total liabilities	17,312	44,936
Commitments and contingencies (Note 12)		
Stockholders' equity		
Common stock, $0.001 par value; 200,000,000 shares authorized at December 31, 2019 and 2018, respectively; 23,899,261 and 23,000,151 shares issued and outstanding at December 31, 2019 and December 31, 2018, respectively	23	23
Additional paid-in capital	290,215	274,029
Accumulated deficit	(279,400)	(215,884)
Accumulated other comprehensive income (loss)	10	(23)
Total stockholders' equity	10,848	58,145
Total liabilities and stockholders' equity	$ 28,160	$ 103,081

The accompanying notes are an integral part of these financial statements.

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

	Years Ended December 31,		
	2019	2018	2017
License revenue	$ 36	$ 18,036	$ 41
Operating expenses:			
Research and development	45,299	51,080	29,113
General and administrative	16,248	12,809	8,556
Total operating expenses	61,547	63,889	37,669
Loss from operations	(61,511)	(45,853)	(37,628)
Other income (expense), net:			
Interest income	1,564	1,534	595
Interest expense	(3,820)	(2,930)	(1,932)
Loss on disposal of assets	(1,187)	(7)	—
Gain on lease modification	1,439	—	—
Change in fair value of preferred stock warrants	—	—	37
Loss before income taxes	(63,515)	(47,256)	(38,928)
Income tax expense	1	1,699	1
Net loss	$ (63,516)	$ (48,955)	$ (38,929)
Other comprehensive income (loss):			
Net unrealized gain (loss) on investments	33	11	(34)
Comprehensive loss	$ (63,483)	$ (48,944)	$ (38,963)
Net loss per common share, basic and diluted	$ (2.69)	$ (2.44)	$ (2.66)
Weighted-average number of common shares outstanding, basic and diluted	23,630,422	20,059,541	14,607,609

The accompanying notes are an integral part of these financial statements.

TOCAGEN INC.
STATEMENTS OF CHANGES IN CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY (DEFICIT)
(in thousands, except share and per share data)

	Convertible Preferred Stock		Common Stock		Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity (Deficit)
	Shares	Amount	Shares	Amount				
Balance at December 31, 2016	46,163,605	131,413	2,202,517	2	3,581	(128,000)	—	(124,417)
Exercise of stock options	—	—	55,669	—	81	—	—	81
Issuance of common stock pursuant to employee stock purchase plan	—	—	50,121	—	426	—	—	426
Stock-based compensation	—	—	—	—	4,451	—	—	4,451
Fractional shares adjustment upon reverse stock split	—	—	2	—	—	—	—	—
Preferred stock converted into shares of common stock	(46,163,605)	(131,413)	6,690,066	7	131,403	—	—	131,410
Initial public offering of common shares, net of issuance costs	—	—	9,775,000	10	86,938	—	—	86,948
Convertible promissory notes converted into shares of common stock, net of issuance costs	—	—	1,109,176	1	11,056	—	—	11,057
Preferred stock warrant liabilities converted into warrants to purchase shares of common stock	—	—	—	—	89	—	—	89
Other comprehensive loss	—	—	—	—	—	—	(34)	(34)
Net Loss	—	—	—	—	—	(38,929)	—	(38,929)
Balance at December 31, 2017	—	—	19,882,551	20	238,025	(166,929)	(34)	71,082
Exercise of stock options	—	—	45,073	—	67	—	—	67
Issuance of common stock pursuant to employee stock purchase plan	—	—	72,527	—	594	—	—	594
Issuance of common stock, net of offering costs	—	—	3,000,000	3	27,994	—	—	27,997
Stock-based compensation	—	—	—	—	6,870	—	—	6,870
Issuance of common stock warrants	—	—	—	—	479	—	—	479
Other comprehensive loss	—	—	—	—	—	—	11	11
Net Loss	—	—	—	—	—	(48,955)	—	(48,955)
Balance at December 31, 2018	—	$ —	23,000,151	$ 23	$ 274,029	$ (215,884)	$ (23)	$ 58,145
Exercise of stock options	—	—	69,697	—	252	—	—	252
Issuance of common stock pursuant to employee stock purchase plan	—	—	69,324	—	299	—	—	299
Issuance of common stock, net of offering costs			760,089	—	7,575			7,575
Stock-based compensation	—	—	—	—	8,060	—	—	8,060
Other comprehensive loss	—	—	—	—	—	—	33	33
Net Loss	—	—	—	—	—	(63,516)	—	(63,516)
Balance at December 31, 2019	—	$ —	23,899,261	$ 23	$ 290,215	$ (279,400)	$ 10	$ 10,848

The accompanying notes are an integral part of these financial statements.

TOCAGEN INC.
STATEMENTS OF CASH FLOWS
(in thousands)

	Years Ended December 31,		
	2019	**2018**	**2017**
OPERATING ACTIVITIES			
Net loss	$ (63,516)	$ (48,955)	$ (38,929)
Adjustments to reconcile net loss to net cash used in operating activities:			
Stock-based compensation	8,060	6,870	4,451
Depreciation	843	625	292
Noncash interest expense	1,698	1,161	590
Change in fair value of preferred stock warrants	—	—	(37)
Accretion of discount on investments, net	161	(248)	(19)
Loss on disposal of property and equipment	1,212	—	—
Gain on lease modification	(1,439)	—	—
Changes in operating assets and liabilities:			
Prepaid expenses and other current assets	2,502	(208)	(679)
Accounts payable	(58)	1,260	304
Accrued liabilities	(8,911)	4,127	2,946
Deferred license revenue	(36)	(36)	(41)
Other	246	935	(11)
Net cash used in operating activities	(59,238)	(34,469)	(31,133)
INVESTING ACTIVITIES			
Proceeds from the sale/maturity of marketable securities	93,473	68,524	43,725
Purchases of marketable securities	(51,163)	(70,746)	(70,797)
Purchases of property and equipment	(428)	(1,968)	(655)
Proceeds from sale of property and equipment	437	—	20
Net cash provided by (used in) investing activities	42,319	(4,190)	(27,707)
FINANCING ACTIVITIES			
Proceeds from issuance of notes payable, net of issuance costs	—	26,325	—
Cash paid on extinguishment of debt	—	(8,631)	—
Principal payments on notes payable	(23,155)	(3,000)	(7,200)
Proceeds from issuance of common stock	551	661	507
Proceeds from offering of common stock, net of issuance costs	7,696	28,200	88,618
Proceeds from issuance of convertible promissory notes, net of issuance costs	—	—	7,338
Cash paid for deferred equity issuance costs		(16)	—
Net cash (used in) provided by financing activities	(14,908)	43,539	89,263
Net increase (decrease) in cash and cash equivalents	(31,827)	4,880	30,423
Cash and cash equivalents, beginning of period	40,813	35,933	5,510
Cash and cash equivalents, end of period	$ 8,986	$ 40,813	$ 35,933
SUPPLEMENTAL DISCLOSURES OF CASH FLOW INFORMATION			
Cash paid for interest	$ 2,290	$ 1,522	$ 1,210
Allowance for tenant improvements included in deferred rent	$ —	$ 1,243	$ —
Property and equipment purchases included in accounts payable and accrued liabilities	$ —	$ 178	$ 111
Fair value of common stock warrants issued in connection with notes payable	$ —	$ 479	$ —
Convertible preferred stock converted into shares of common stock	$ —	$ —	$ 131,410
Convertible promissory notes principal and accrued interest converted into shares of common stock	$ —	$ —	$ 11,057
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 equity issuance costs in accounts payable and accrued liabilities	$ —	$ 310	$ 96

The accompanying notes are an integral part of these 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. 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. The Company views its operations and manages its business in one operating segment.

From inception through December 31, 2019, 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.

On October 1, 2019, the Company commenced a corporate restructuring plan that included reducing its workforce by approximately 65% in order to preserve the Company's resources. The restructuring was approved by the Company's Board of Directors on October 1, 2019, and affected employees were informed on October 2, 2019. The Company incurred a personnel-related restructuring charge of $0.9 million for employee severance and other related termination benefits. As of December 31, 2019, $0.2 million of severance related payments remained unpaid.

ATM Facility

In November 2018, the Company entered into an Equity Distribution Agreement with Citigroup Global Markets Inc. ("Citigroup"), pursuant to which the Company may sell and issue shares of its common stock having an aggregate offering price of up to $30,000,000 from time to time through Citigroup, as its sales agent (the "ATM facility"). As of December 31, 2019, the Company has sold 760,089 shares of common stock and received net proceeds of $7.7 million under the ATM facility.

Public Offering

In December 2018, the Company completed a public offering in which it sold an aggregate of 3,000,000 shares of common stock at a price of $10.00 per share. Net proceeds from the public offering, after deducting underwriting discounts, commissions and offering expenses, were approximately $28.0 million.

Liquidity

The accompanying financial statements have been prepared on a basis which assumes the Company is a going concern, and do not include any adjustments to reflect the possible future effects on the recoverability and classification of assets or the amounts and classifications of liabilities that may result from any uncertainty related to the Company's ability to continue as a going concern. The Company has experienced net losses and negative cash flows from operating activities since its inception. As of December 31, 2019, the Company had an accumulated deficit of $279.4 million and working capital of $9.8 million available to fund future operations.

Based on the Company's operating plans, cash, cash equivalents and marketable securities may not be sufficient to fund operations for the next 12 months. As a result, there is substantial doubt about the Company's ability to continue as a going concern. All amounts due under the Term Loans (see note 5) have been classified as a current liability as of December 31, 2019 due to the considerations discussed above and the assessment that a material adverse change clause under the Term Loans is not within the Company's control. On October 31, 2019, the Company entered into an amendment (the Second Amendment) to its Amended and Restated Loan and Security Agreement with the two lenders, dated May 18, 2018, which was further amended on August 3, 2018 (the Loan Agreement), and made a prepayment of $23.3 million, which amount was used to prepay i) a portion equal to $21.5 million of the outstanding principal of the Term Loans plus all accrued and unpaid interest thereon through the prepayment date, ii) prorated portion of the final payment with respect to the portion of such Term Loans being prepaid, plus iii) all outstanding lenders' expenses as of the date of the Second Amendment.

The Company may seek to fund its losses from operations and capital needs through debt and equity financing, or through collaborations or partnerships with other entities, such funding may not be available on a timely basis on terms acceptable to the Company, or at all. If the Company is unable to raise additional capital when required or on acceptable terms, the Company may be required to further scale back or discontinue the advancement of product candidates, further reduce headcount, reorganize, merge with another entity, file for bankruptcy, or cease operations.

As of December 31, 2019, the Company had cash, cash equivalents and marketable securities of $21.8 million.

Use of Estimates

The Company's financial statements are prepared in accordance with accounting principles generally accepted in the United States, which requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenue and expenses and the disclosure of contingent assets and liabilities in the financial statements accompanying notes. 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.

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, corporate debt securities and certificates of deposit with remaining maturities of three months or less at the time of purchase, and are considered highly liquid investments. Marketable securities consist of corporate debt securities, commercial paper, U.S. treasury securities and asset-backed 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. 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.

Prepaid Expenses and Other Current Assets

Prepaid expenses and other current assets primarily represent amounts related to insurance, clinical trial and manufacturing agreements, and investment interest receivable.

Property and Equipment

Property and equipment is stated at cost and depreciated over the estimated useful lives of the assets (three to five years) using the straight-line method. Leasehold improvements are depreciated using the straight-line method over the lesser of the remaining lease term or an estimated useful life .

Costs of major additions and betterments are capitalized and depreciated on a straight-line basis over their useful lives. Repairs and maintenance costs are expensed as incurred. Upon retirement or sale, the cost of assets disposed of and the related accumulated depreciation are removed from the accounts, and any resulting gain or loss is credited or charged to expense.

Deferred Equity Issuance Costs

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

Impairment of Long-Lived Assets

Long-lived assets consist of property and equipment. An impairment loss is recorded if and when events and circumstances indicate that assets might be impaired and the undiscounted cash flows estimated to be generated by those assets are less than the carrying amount of those assets. No impairment loss has been recognized for the years ended December 31, 2019 and 2018.

Fair Value of Financial Instruments

The Company's financial instruments consist principally of cash, cash equivalents, marketable securities, prepaid expenses, other current assets, accounts payable and notes payable. The carrying amounts of these financial instruments approximate the related fair values due to the short-term maturities of these instruments.

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. Historically, the Company's estimated accrued liabilities have materially approximated actual expense incurred.

Revenue Recognition

Revenue generally consists of license revenue with upfront payments and development milestones considered probable of achievement.

Revenue is recognized when control of the promised goods or services is transferred to the Company's customers in an amount that reflects the consideration the Company expects to receive from its customers in exchange for those goods and services. This process involves identifying the contract with a customer, determining the performance obligations in the contract, determining the transaction price, allocating the contract price to the distinct performance obligations in the contract, and recognizing revenue when or as the Company satisfies the performance obligation(s).

At contract inception, the Company assesses the goods and services promised within each contract and assesses whether each promised good or service is distinct and determines that those are performance obligations. A performance obligation is considered distinct from other obligations in a contract when it provides a benefit to the customer either on its own or together with other resources that are readily available to the customer and is separately identified in the contract. 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. The Company considers a performance obligation satisfied once the Company has transferred control of a good or service to the customer, meaning the customer has the ability to use and obtain the benefit of the good or service. The Company recognizes revenue for satisfied performance obligations only when the Company determines there are no uncertainties regarding payment terms or transfer of control.

Collaborative Arrangements

The Company enters into collaborative arrangements with partners that may include payment to the Company of one or more of the following: (i) license fees; (ii) payments related to the achievement of developmental, regulatory, or commercial milestones; and (iii) royalties on net sales of licensed products. Where a portion of non-refundable upfront fees or other payments received are allocated to continuing performance obligations under the terms of a collaborative arrangement, they are recorded as contract liabilities and recognized as revenue when (or as) the underlying performance obligation is satisfied.

As part of the accounting for these arrangements, the Company must develop estimates and assumptions that require judgment to determine the underlying stand-alone selling price for each performance obligation which determines how the transaction price is allocated among the performance obligation(s). The stand-alone selling price may include items such as forecasted revenues, development timelines, discount rates, and probabilities of technical and regulatory success. The Company evaluates each performance obligation to determine if it can be satisfied at a point in time or over time. In addition, variable consideration must be evaluated to determine if it is constrained and, therefore, excluded from the transaction price.

License Fees

If a license to the Company's intellectual property is determined to be distinct from the other performance obligations identified in the arrangement, the Company recognizes revenues from non-refundable, upfront fees allocated to the license when the license is transferred to the licensee and the licensee is able to use and benefit from the license. For licenses that are bundled with other promises, the Company utilizes judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition. Any such adjustments are recorded on a cumulative catch-up basis, which would affect license, collaboration or other revenues and earnings in the period of adjustment.

Milestone Payments

At the inception of each arrangement that includes milestone payments (variable consideration), the Company evaluates whether the milestones are considered probable of being reached and estimates the amount to be included in the transaction price. If it is probable that a milestone event would occur at the inception of the arrangement, the associated milestone value is included in the transaction price. Milestone payments that are not within the Company's control, such as regulatory approvals, are generally not considered probable of being achieved until those approvals are received. The transaction price is then allocated to each performance obligation on a relative stand-alone selling price basis, for which the Company recognizes revenue as or when the performance obligations under the contract are satisfied. At the end of each reporting period, the Company evaluates the probability of achievement of such milestones and any related constraint(s), and if necessary, may adjust the Company's estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect license, collaboration or other revenues and earnings in the period of adjustment.

Royalties

For arrangements that include sales-based royalties, including milestone payments based on the level of sales, and for which the license is deemed to be the predominant item to which the royalties relate, the Company recognizes revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, the Company has not recognized any royalty revenue resulting from its collaborative arrangements.

Research and Development Costs

Research and development expenses consist primarily of salaries and other personnel related expenses including non-cash 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.

Patent Costs

Costs related to filing and pursuing patent applications are recorded as general and administrative expense and expensed as incurred because recoverability of such expenditures is uncertain.

Grant Funding

The Company receives certain research and development funding through grants from nonprofit organizations that serve the brain cancer community. The Company evaluates the terms of each grant to assess the Company's obligations, and such funding is recognized in the statement of operations as a reduction to research and development expense as the related costs are incurred to meet those obligations over the grant period. Certain grants contain repayment provisions contingent on future events, such as future revenue milestones related to the Company's lead product candidate under development. For each repayment provision, the Company assesses if it is obligated to repay the funds provided by the other parties regardless of the outcome of the funded research and development. For each arrangement, the Company also reviews the repayment provisions to determine the likelihood of repayment at the execution of each grant and on an ongoing basis. If the likelihood of repayment of a grant is determined to be remote and the Company is not obligated to repay the funds regardless of the outcome of the funded research and development, the grant is recognized as a reduction to research and development expense as related costs are incurred over the grant period. The Company subsequently reviews the repayment provisions of each grant at each reporting date and will record a related grant repayment liability if and when such repayment obligation is determined to be probable. If, at the execution of a grant with repayment provisions, the probability of repayment is probable, the Company will record the grant as a liability until such time as the grant requirements have been satisfied and the repayment provisions have lapsed.

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 Common Stock

The Company accounts for warrants for shares of common stock as equity instruments in the accompanying balance sheets at their fair value on the date of issuance because such warrants are indexed to the Company's common stock and no cash settlement is required except for (i) liquidation of the Company, or (ii) a change in control in which the common stockholders also receive cash.

Income Taxes

The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences that have been included in the financial statements. Under this method, deferred tax assets and liabilities are determined on the basis of the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The Company provides a valuation allowance against net deferred tax assets unless, based upon the available evidence, it is more likely than not that the deferred tax assets will be realized.

The Company records uncertain tax positions on the basis of a two-step process whereby (i) management determines whether it is more likely than not that the tax positions will be sustained on the basis of the technical merits of the position and (ii) for those tax positions that meet the more likely-than-not recognition threshold, management recognizes the largest amount of tax benefit that is more than 50 percent likely to be realized upon ultimate settlement with the related tax authority. The Company will recognize interest and penalties in income tax expense if and when incurred.

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 and members of the Company's board of directors. 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.

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 options to purchase shares of common stock outstanding under the Company's equity incentive plan and warrants for the purchase of shares of common. 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 that are not included in the calculation of diluted net loss per share, because to do so would be anti-dilutive, are as follows:

	Years Ended December 31,		
	2019	2018	2017
Common stock options	4,334,935	3,476,847	2,589,348
Common stock warrants	66,514	67,238	10,660
Total	4,401,449	3,544,085	2,600,008

Recent Accounting Pronouncements

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)*. The new standard is aimed at making leasing activities more transparent and comparable. Under the new guidance, lessees are required to recognize substantially all leases on their balance sheet as 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 Company adopted Topic 842 on January 1, 2019 using the modified retrospective approach with a cumulative-effect adjustment as of January 1, 2019. The Company recognized a right-of-use asset and a lease liability on the balance sheet for the discounted value of future lease payments from the date of adoption. The impact on the balance sheet as of the date of adoption was as follows (in thousands):

	ASC 840 January 1, 2019	ASC 842 January 1, 2019	Impact of Adoption
Balance Sheet			
Accrued liabilities	$ 154	$ 645	$ 491
Deferred rent, net of current portion	2,201	—	(2,201)
Operating lease right-of-use asset	—	8,060	8,060
Operating lease liability, net of current portion	—	9,770	9,770

In June 2018, the FASB issued ASU 2018-07, *Compensation- Stock Compensation (Topic 718), Improvements to Nonemployee Share-Based Payment Accounting*. This new standard is intended to simplify aspects of share-based compensation issued to non-employees by aligning the accounting for share-based payment awards issued to employees and non-employees as it relates to the measurement date and impact of performance conditions. The new standard became effective January 1, 2019 and did not have a material impact to the overall financial statements of the Company.

3. Fair Value of Financial Instruments

Fair Values of Assets Measured on a Recurring Basis

The following tables summarize the Company's assets 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)
December 31, 2019				
Marketable securities:				
Corporate debt securities	$ 3,700	$ —	$ 3,700	$ —
Commercial paper	5,485	—	5,485	—
Asset-backed securities	3,650	—	3,650	—
	$ 12,835	$ —	$ 12,835	$ —

		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, 2018				
Cash equivalents:				
Corporate debt securities	$ 4,783	$ —	$ 4,783	$ —
Commercial paper	1,987	—	1,987	—
	$ 6,770	$ —	$ 6,770	$ —
Marketable securities:				
Corporate debt securities	$ 16,301	$ —	$ 16,301	$ —
Commercial paper	24,576	—	24,576	—
U.S. treasury securities	1,997	1,997	—	—
Asset-backed securities	12,399	—	12,399	—
	$ 55,273	$ 1,997	$ 53,276	$ —

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 corporate debt securities, certificates of deposit, commercial paper, repurchase agreements and asset-backed securities 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 years ended December 31, 2019 or 2018.

At December 31, 2019 and 2018, the Company had investments in money market funds of $6.3 million and $30.9 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.

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 $4.7 million at December 31, 2019 approximated their fair value as the terms of the notes are consistent with the market terms of transactions with similar profiles (Level 2 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
December 31, 2019					
Corporate debt securities	1 or less	$ 2,699	$ 1	$ —	$ 2,700
Corporate debt securities	>1 and <5	999	1	—	1,000
Commercial paper	1 or less	5,481	4	—	5,485
Asset-backed securities	1 or less	3,646	4	—	3,650
		$ 12,825	$ 10	$ —	$ 12,835
December 31, 2018					
Corporate debt securities	1 or less	$ 10,013	$ 1	$ (4)	$ 10,010
Corporate debt securities	>1 and <5	6,293	2	(4)	6,291
Commercial paper	1 or less	24,584	—	(8)	24,576
U.S. treasury securities	1 or less	1,997	—	—	1,997
Asset-backed securities	1 or less	10,612	—	(8)	10,604
Asset-backed securities	>1 and <5	1,797		(2)	1,795
		$ 55,296	$ 3	$ (26)	$ 55,273

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.

Property and Equipment

Property and equipment is comprised of (in thousands):

	December 31,	
	2019	2018
Laboratory equipment	$ 2,184	$ 4,445
Computers, software and office equipment	252	322
Furniture and fixtures	216	610
Leasehold improvements	636	1,927
	3,288	7,304
Less: accumulated depreciation	(1,599)	(3,331)
	$ 1,689	$ 3,973

Depreciation expense was $0.8 million and $0.6 million for the years ended December 31, 2019 and 2018, respectively.

Accrued Liabilities

Accrued liabilities are comprised of (in thousands):

	December 31,	
	2019	2018
Clinical trial expenses	$ 2,404	$ 4,535
Payroll and other employee-related expenses	1,116	2,840
Contract manufacturing services	387	3,411
Lease liability	416	—
Professional fees	330	474
Interest payable	37	205
Other	552	1,629
Total accrued liabilities	$ 5,242	$ 13,094

5. Notes Payable

Loan Agreement

On October 30, 2015, the Company entered into a Loan and Security Agreement (Prior Agreement) with two lenders whereby it borrowed $18.0 million (the Initial Loans). Balances under the Prior Agreement were due in monthly principal and interest payments, with final maturity of the Initial Loans in May 2019. Each Initial Loan included a final payment fee of 7.95% of the original principal amount due upon maturity.

On May 18, 2018, the Company entered into an Amended and Restated Loan and Security Agreement, which was further amended on August 3, 2018, pursuant to which the lenders agreed to lend the Company $26.5 million as term loans (the Term Loans). Of the total proceeds, $8.6 million was applied to the repayment of outstanding principal, interest and final payment owed pursuant to the Initial Loans.

The Company evaluated the May 2018 Amended and Restated Loan and Security Agreement in accordance with ASC Topic 470, which requires assessment of whether the modification is considered a substantial modification, in which case the modification would be accounted for as a debt extinguishment. Based on the Company's evaluation, the May 2018 Amended and Restated Loan and Security Agreement was considered substantial and therefore the unamortized discount associated with the Prior Agreement was written off through interest expense and the principal balance of the Prior Agreement was written off.

The Term Loans will mature on December 1, 2022 (the Maturity Date) and the Company makes interest-only payments through January 1, 2020, followed by 36 equal monthly payments of principal and interest.

The Term Loans bear interest at a floating per annum rate equal to the greater of (i) 8.50% and (ii) the sum of (a) the prime rate reported in the Wall Street Journal on the last business day of the month that immediately proceeds the month in which the interest will accrue, plus (b) 3.75%. The Company will be required to make a final payment of 7.95% of the principal amount of the Term Loans payable on the earlier of (i) the Maturity Date, (ii) the acceleration of any Term Loans, or (iii) the prepayment of the Term Loans. On October 31, 2019, the Company entered into the Second Amendment and made a prepayment of $23.3 million, which amount was used to prepay i) a portion equal to $21.5 million of the outstanding principal of the Term Loans plus all accrued and unpaid interest thereon through the prepayment date, ii) prorated portion of the final payment with respect to the portion of such Term Loans being prepaid, plus iii) all outstanding lenders' expenses as of the date of the Second Amendment.

In connection with the Second Amendment, the lenders (i) agreed to waive any prepayment fee otherwise applicable to a prepayment of the Term Loans in connection with any prepayment of the Term Loans on or after the date of the Second Amendment, (ii) consent to the sale of certain specified equipment, so long as the net cash proceeds from the sale of such assets are used to repay the Term Loans, and (iii) release their lien on the specified equipment upon the closing of any such sale. Under the Second Amendment, the Company has also agreed to grant a security interest in the Company's intellectual property as additional collateral to secure the Term Loans for the ratable benefit of the lenders.

In conjunction with the Loan Agreement, the Company issued the lenders warrants exercisable for 56,578 shares of common stock (the Warrants). The Warrants are exercisable in whole or in part, immediately, and have a per share exercise price of $9.35. The Warrants will terminate on the earlier of May 18, 2028 or the closing of a certain merger or consolidation transaction. The Company recorded the Warrants as a debt discount, which is a contra-liability against debt. The offset to the contra-liability is recorded as additional paid in capital in the Company's balance sheet as the Warrants were determined to be an equity instrument. The Company determined the fair value of the Warrants at the date of issuance was $0.5 million using the Black-Scholes option pricing model based on significant unobservable inputs (Level 3) with an expected term of 10 years, volatility of 85.6%, risk free rate of 3.1% and expected dividend of 0%.

The costs incurred to issue the Term Loans of $0.1 million were deferred and are included in the discount to the carrying value of the Term Loans in the accompanying balance sheet. The deferred costs and the final payment fee are amortized to interest expense over the expected term of the Term Loans using the effective interest method with an effective interest rate of 10.7%.

The aggregate carrying amounts of the Term Loans and Initial Loans are comprised of the following, as applicable (in thousands):

	December 31,	
	2019	2018
Principal	$ 5,000	$ 26,450
Add: accreted liability for final payment fee	138	276
Less: unamortized discount	(394)	(525)
	$ 4,744	$ 26,201

The Term Loans are secured by all of the Company's assets, including 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. As of December 31, 2019, the Company was in compliance with the covenants contained in the Loan Agreement.

Based on the Company's operating plans, cash, cash equivalents and marketable securities may not be sufficient to fund operations for the next 12 months. As a result, there is substantial doubt about the Company's ability to continue as a going concern. All amounts due under the Term Loans have been classified as a current liability on the balance sheet.

Future maturities of the Term Loans, including the final payment fee, as of December 31, 2019 are as follows (in thousands):

	December 31, 2019
Year ending December 31, 2020	1,667
Year ending December 31, 2021	1,667
Year ending December 31, 2022	2,064
Notes payable, current portion	5,398
Unaccreted balance for final payment fee on Loans	(260)
Unamortized discounts	(394)
	4,744

6. Stockholders' Equity

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 December 31, 2019, 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.

In December 2018, the Company completed a public offering in which it sold an aggregate of 3,000,000 shares of common stock at a price of $10.00 per share. Net proceeds from the public offering, after deducting underwriting discounts, commissions and offering expenses, were approximately $28.0 million.

During the year ended December 31, 2019, the Company sold 760,089 shares of common stock under the Sales Agreement, respectively. The sales were made at a weighted average price of $10.41. The Company received net proceeds of $7.7 million during

the year ended December 31, 2019 and may sell up to an additional $22.1 million in shares of the Company's common stock under the Sales Agreement.

Common Stock Reserved for Future Issuance

Common stock reserved for future issuance as of December 31, 2019 and 2018 is as follows:

	December 31,	
	2019	2018
Issued and Outstanding:		
Stock options	4,334,935	3,476,847
Warrants for common stock	66,514	67,238
Shares reserved for issuance under the ESPP	486,855	326,178
Shares reserved for future award grants	543,284	451,063

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, which became effective on April 12, 2017 and was subsequently amended September 30, 2018 and further amended February 12, 2019 (the 2017 Plan). 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 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.

All grants of options to purchase common stock under the 2017 Plan expire in 10 years. Grants with time-based vesting provisions are generally 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 Company's equity incentive plans for the year ended December 31, 2019:

	Shares Subject to Options	Weighted-Average Exercise Price per Share	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value (in thousands)
Options Outstanding at December 31, 2018	3,476,847	$ 12.67		
Granted	1,841,380	$ 7.60		
Exercised	(69,697)	$ 3.61		
Forfeitures and cancellations	(913,595)	$ 11.67		
Options Outstanding at December 31, 2019	4,334,935	$ 10.87	7.2	
Options Exercisable at December 31, 2019	2,128,758	$ 11.58	5.8	$ -

The following table summarizes certain information regarding stock options (in thousands):

	Years Ended December 31,		
	2019	2018	2017
Fair value of options vested during the period	$ 6,336	$ 6,318	$ 2,194
Cash received from options exercised during the period	$ 252	$ 67	$ 81
Intrinsic value of options exercised during the period	$ 491	$ 508	$ 677

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.

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. Initially, 250,000 shares of the Company's common stock were approved for issuance under the ESPP 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 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).

As of December 31, 2019, the Company had issued 191,972 shares of common stock under the ESPP, with 69,324 of such shares of common stock being issued during the year ended December 31, 2019. The Company had 486,855 shares available for future issuance under the ESPP as of December 31, 2019. Effective December 11, 2019, the Company suspended the ESPP for any additional offering periods after December 10, 2019. Any enrollments that have been submitted to date for the next enrollment period that was scheduled to begin on December 11, 2019 have been cancelled.

Stock-Based Compensation Expense

The weighted average assumptions used in the Black-Scholes option pricing model to determine the fair value of the employee stock option grants with both time-based and performance-based vesting provisions and stock purchase rights were as follows:

	Years Ended December 31,		
	2019	2018	2017
Time based stock options			
Risk-free interest rate	2.2%	2.7%	2.0%
Volatility	82.6%	85.9%	82.2%
Dividend yield	0%	0%	0%
Expected term (in years)	5.9	6.1	6.1
Grant date fair value per share	$ 5.31	$ 8.12	$ 10.39
Performance based stock options			
Risk-free interest rate	—	—	2.1%
Volatility	—	—	75.9%
Dividend yield	—	—	0%
Expected term (in years)	—	—	6.3
Grant date fair value per share	$ —	$ —	$ 6.73
Employee stock purchase plan			
Risk-free interest rate	2.6%	2.5%	1.2%
Volatility	71.6%	78.1%	69.8%
Dividend yield	0%	0%	0%
Expected term (in years)	0.5	1.1	1.3
Grant date fair value per share	$ 4.44	$ 5.02	$ 4.61

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 limited trading of its common stock and 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 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 December 31, 2019.

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):

	Years Ended December 31,		
	2019	2018	2017
Research and development	$ 3,269	$ 3,023	$ 1,783
General and administrative	4,791	3,847	2,668
Total	$ 8,060	$ 6,870	$ 4,451

Unrecognized compensation expense for stock options at December 31, 2019 was $12.1 million which is expected to be recognized over a weighted-average period of 2.5 years.

8. License and Collaboration Agreements

ApolloBio License

On April 18, 2018, the Company entered into a License Agreement (the License Agreement) with Beijing Apollo Venus Biomedical Technology Limited and ApolloBio Corp. (collectively, ApolloBio), which became effective in July 2018, pursuant to which the Company granted to ApolloBio an exclusive license to develop and commercialize Toca 511 & Toca FC within the greater China region, including mainland China, Hong Kong, Macao and Taiwan (the Licensed Territory).

Under the License Agreement, the Company has received net proceeds of $15.2 million which is comprised of a $16.0 million up-front payment and a $2.0 million development milestone payment less $1.7 million in foreign income taxes and $1.1 million in certain foreign non-income taxes. The foreign income taxes were recorded as income tax expense and the foreign non-income taxes were recorded as a general and administrative expense, on the statement of operations during the year ended December 31, 2018.

The Company is eligible to receive up to an aggregate $111.0 million, less withholding and other taxes, upon the achievement of specified development and commercial milestones. The Company completed its planned enrollment of 380 patients in the Toca 5 clinical trial in 2018 and earned a $2.0 million development milestone payment. The Company is also eligible for low double-digit tiered royalty payments based on annual net sales of licensed products in the Licensed Territory, subject to reduction under specified circumstances. ApolloBio will be responsible for all development and commercialization costs in the Licensed Territory. Future payments by ApolloBio are subject to the People's Republic of China (PRC) currency exchange approval and may be subject to other approvals by PRC authorities.

Unless earlier terminated, the License Agreement will expire upon the expiration of the last-to-expire royalty term for any and all licensed products, which royalty term is, with respect to a licensed product in a particular region (*i.e.*, mainland China, Hong Kong, Macao and Taiwan) of the Licensed Territory (each, a Region), the latest of (i) 10 years after the first commercial sale of such licensed product in such Region, (ii) the expiration of all regulatory exclusivity as to such licensed product in such Region and (iii) the date of expiration of the last valid patent claim covering such licensed product in such Region. Either party may terminate the License

Agreement upon a material breach by the other party that remains uncured following 60 days (or, with respect to any payment breach, 10 days) after the date of written notice of such breach. ApolloBio may terminate the License Agreement at any time by providing 90 days' prior written notice to the Company. In addition, the Company may terminate the License Agreement upon written notice to ApolloBio under specified circumstances if ApolloBio challenges the licensed patent rights.

Under Topic 606, the Company evaluated the terms of the License Agreement and the transfer of intellectual property rights (the "license") was identified as the only performance obligation as of the inception of the License Agreement. The Company determined that the transaction price under the License Agreement was comprised solely of the $16.0 million upfront payment. The future potential development and commercial milestone payments were not included in the transaction price as they were determined to be fully constrained. As part of the evaluation of the development and commercial milestone constraint, the Company determined that the achievement of such milestones is contingent upon success in future clinical trials and regulatory approvals, each of which was uncertain at the inception of the License Agreement. The Company will re-evaluate the transaction price each quarter or as uncertain events are resolved or other changes in circumstances occur. Future potential development and commercial milestone amounts would be recognized as revenue, if unconstrained. Any reimbursable program costs are recognized proportionately with the performance of the underlying services and are accounted for as a reduction to research and development expense and are excluded from the transaction price.

The entire $16.0 million transaction price was allocated to the license performance obligation. The license was delivered in connection with the execution of the License Agreement and the performance obligation was fully satisfied (transfer of intellectual property). Additionally, the Company earned a $2.0 million development milestone payment upon completion of the planned enrollment of 380 patients in the Toca 5 clinical trial.

9. Grant Agreements

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. The Company received reimbursable amounts of $0.5 million for each of the years ended December 31, 2019, 2018 and 2017 relating to the OOPD Grant as an offset against research and development costs incurred during the period.

10. Income Taxes

Significant components of the income tax expense are as follows (in thousands):

	Year ended December 31,		
	2019	2018	2017
Current			
Federal	$ —	$ —	$ —
State	1	1	1
Foreign	—	1,698	—
Total current provision	1	1,699	1
Deferred			
Federal	—	—	—
State	—	—	—
Total Deferred	—	—	—
Income Tax Expense	$ 1	$ 1,699	$ 1

The (benefit) provision for income taxes differs from the amount of income tax determined by applying the applicable U.S. statutory federal income tax rate to pretax income as a result of the following differences:

	Years Ended December 31,		
	2019	2018	2017
Federal statutory rate	21.0%	21.0%	34.0%
Adjustments for tax effects of:			
State taxes, net	—%	6.1%	5.7%
Withholding Tax	—%	(3.6)%	
Permanent adjustments	(1.4)%	(1.0)%	(4.5)%
Tax Cuts and Jobs Act	—%	—%	(3.7)%
Net operating loss carryovers not recognized	(18.8)%	(22.1)%	(30.4)%
Valuation allowance	1.1%	(5.9)%	(1.0)%
Other	(1.9)%	1.9%	(0.1)%
Effective income tax rate	—%	(3.7)%	—%

Deferred taxes are recognized for temporary differences between the basis of assets and liabilities for financial statement and income tax purposes. Significant components of the Company's deferred taxes are as follows (in thousands):

	December 31,	
	2019	2018
Deferred tax assets:		
Depreciation and amortization	$ 32	$ —
Deferred license revenue	—	10
Share-based compensation	3,793	3,432
Debt discount	79	137
Lease liability	935	644
Accrued liabilities and other	288	1,134
Total deferred tax assets	5,127	5,357
Less valuation allowance	(4,386)	(5,107)
Net deferred tax assets	$ 741	$ 250
Deferred tax liabilities:		
Right of use asset	$ (739)	$ —
Depreciation and amortization	—	(250)
Other	(2)	—
Total Deferred tax liabilities	$ (741)	$ (250)
Net deferred taxes	$ —	$ —

The Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets. Based upon the Company's history of operating losses, the Company has concluded that it is more likely than not that the benefit of its deferred tax assets will not be realized. Accordingly, the Company has provided a full valuation allowance for deferred tax assets as of December 31, 2019 and 2018. During 2019 and 2018, the valuation allowance decreased by $0.7 million and increased by $2.6 million, respectively.

The Company has federal and California net operating loss carryforwards which may be available to offset future income tax liabilities. As of December 31, 2019, the Company has federal net operating losses of $231.0 million, of which, $136.6 million begin expiring in 2028 unless previously utilized and $94.4 million that do not expire but are limited to 80% of taxable income in a given year. The Company has state net operating loss carryforwards of $76.0 million that begin to expire in 2028 unless previously utilized as of December 31, 2018. Excluded from the California net operating loss carryforward are net operating losses for the years ended December 31, 2013 through 2017 and 2019 which are impacted by a California Supreme Court ruling issued on December 31, 2015. This ruling held that taxpayers must use the single sales factor market based sourcing method in determining their California apportionment. As a result of the ruling, the Company has completed an analysis to determine the re-apportionment of its losses to California using the required single sales factor market sourcing method for 2013 through 2017 and 2019. In doing so, the Company treated its passive interest income as California-source income which results in a 100% apportionment percentage to California. While this portion may not reach the more-likely-than-not recognition threshold, the Company has excluded a cumulative net operating loss of $167.9 million from its California net operating loss carryforward.

As of December 31, 2019, the Company has federal and California research and development tax credit carryforwards of $29.2 million and $7.1 million, respectively. The federal research and development tax credits begin to expire in 2028 unless previously utilized. The California credits do not expire.

Pursuant to Internal Revenue Code (IRC) Sections 382 and 383, annual use of a company's net operating loss and tax credit carryforwards may be limited if there is a cumulative change in ownership of greater than 50% (by value) within a three-year period. The amount of the annual limitation is determined based on the value of the Company immediately prior to the ownership change. Subsequent ownership changes may further affect the limitation in future years. The Company has completed several equity offerings since its inception which may have resulted in a change in control as defined by Sections 382 and 383 of the IRC, or could result in a change in control in the future. The Company has not completed an IRC Section 382 and 383 analysis regarding the limitation of net operating loss and research and development credit carryforwards. Until such an analysis has been completed, the Company has removed the deferred tax assets for net operating losses of $53.8 million and federal and California research and development credits of approximately $34.8 million from its deferred tax asset schedule, and has recorded a corresponding decrease to its valuation allowance. When this analysis is finalized, the Company plans to update its unrecognized tax benefits accordingly. The Company does not expect this analysis to be completed within the next 12 months and, as a result, the Company does not expect that the unrecognized tax benefits will change within 12 months of this reporting date. Due to the existence of the valuation allowance, future changes in the Company's unrecognized tax benefits will not impact the Company's effective tax rate.

The Company's policy is to record interest and penalties relating to uncertain tax positions as a component of income tax expense. As of December 31, 2019 and 2018, there was no accrued interest or penalties for uncertain tax positions.

The Company is subject to taxation in the U.S. and various state jurisdictions. As of December 31, 2019, the Company's tax years beginning 2007 to date are subject to examination by federal and California taxing authorities due to the carry forward of unutilized net operating losses and research and development tax credits. To the extent the Company has tax attribute carryforwards, the tax years in which the attribute was generated may still be adjusted upon examination by the Internal Revenue Service or state tax authorities to the extent utilized in a future period.

11. Retirement Plan

The Company sponsors an employee savings plan that qualifies as a deferred salary arrangement under Section 401(k) of the IRC. Participating employees may defer up to the Internal Revenue Service annual contribution limit. The Company has elected to match 50% of an employee's contributions up to 6% of the employees' eligible salary beginning January 1, 2019. The Company made contributions of $0.3 million for the year ended December 31, 2019.

12. Commitments and Contingencies

Leases and Other Commitments

The Company leases its office and laboratory space located in San Diego, California, under an operating lease agreement (the Lease). The Lease commenced in March 2018. The term of the Lease is eight years and the Company has one option to extend the Lease for a period of five additional years.

In connection with the inception of the Lease, the Company was provided and fully utilized a tenant improvement allowance of $1.2 million. The Lease provides for an abatement of a portion of the lease payments for the first nine months of the lease term and includes escalation clauses in the future.

On December 16, 2019, the Company entered into a First Amendment (the "Lease Amendment") to the Lease. Under the terms of the Lease Amendment, the termination date of a portion of the premises containing approximately 21,180 rentable square feet was accelerated from June 30, 2026 to December 31, 2019. The Lease Amendment eliminated further rents due for the terminated rentable square feet, including aggregate base rent over the remaining term of approximately $7.6 million.

As of December 31, 2019, the Company continues to lease approximately 17,669 rentable square feet from the Landlord.

As of December 31, 2019, future annual minimum rental payments payable under the Lease are as follows (shown in thousands):

Years ended December 31:	
2020	882
2021	913
2022	945
2023	978
2024	1,012
Thereafter	1,580
Total	$ 6,310

The Company enters into service agreements with indemnification clauses in the ordinary course of business. Pursuant to such clauses, the Company indemnifies, defends, holds harmless, and agrees to reimburse the indemnified party for losses suffered or incurred by third party claims arising out of the indemnified party's performance of service. The Company has not incurred costs to defend lawsuits pursuant to these indemnification clauses.

Legal Proceedings

From time to time, the Company may be involved in various claims and legal proceedings relating to claims arising out of the Company's operations. The Company is not currently a party to any legal proceedings that, in the opinion of management, are likely to have a material adverse effect on the Company's business. Regardless of outcome, litigation can have an adverse impact on the Company because of defense and settlement costs, diversion of management resources and other factors.

13. Selected Quarterly Financial Data (unaudited)

The following table contains unaudited quarterly financial information for the years ended December 31, 2019 and 2018. The Company believes that the following information reflects all normal recurring adjustments necessary for a fair statement of the information for the periods presented. The operating results for any quarter are not necessarily indicative of results for any future period.

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Year Ended December 31, 2019				
Operating expenses	$ 16,880	$ 16,824	$ 17,132	$ 10,711
Net loss	(17,084)	(17,114)	(18,735)	(10,583)
Net loss per common share, basic and diluted	$ (0.74)	$ (0.72)	$ (0.78)	(0.45)
Year Ended December 31, 2018				
Operating expenses	$ 12,855	$ 15,336	$ 16,582	$ 19,116
Net loss	(12,880)	(16,089)	(383)	(19,603)
Net loss per common share, basic and diluted	$ (0.65)	$ (0.81)	$ (0.02)	(0.96)

14. Subsequent Events

Signed merger agreement

On February 19, 2020, the Company and Forte Biosciences, Inc. ("Forte") signed an Agreement and Plan of Merger and Reorganization ("Merger Agreement"). Upon the terms and subject to the satisfaction of the conditions described in the Merger Agreement, including approval of the transaction by the Company's stockholders, a wholly-owned subsidiary of the Company will be merged with and into Forte, with Forte surviving the Merger as a wholly-owned subsidiary of the Company.

The proposed Merger is structured as a stock-for-stock transaction whereby all of Forte's outstanding shares of common stock and securities convertible into or exercisable for Forte’s common stock will be converted into the right to receive Tocagen common stock and securities convertible into or exercisable for Tocagen common stock. Under the exchange ratio formula in the Merger Agreement, the former Forte equityholders immediately before the Merger are expected to own approximately 74.5% of the outstanding capital stock of Tocagen, and the equityholders of Tocagen immediately before the Merger are expected to own approximately 25.5% of the outstanding capital stock of Tocagen, on a fully diluted basis using the treasury stock method subject to certain assumptions. We anticipate that the Merger will close in the second quarter of 2020.

Additional restructuring

The Company further reduced its workforce in 2020 as a result of the proposed Merger. The Company expects that it will incur personnel-related restructuring charges of approximately $3.0 million for employee severance and other related termination benefits. Severance payments are expected to be paid in full in the first half 2020. The estimates of costs that the Company expects to incur and the timing of payments thereof are subject to a number of assumptions and actual results may differ.

Exhibit 4.2

DESCRIPTION OF COMMON STOCK

General

The following description summarizes the most important terms of our common stock. Because it is only a summary, it does not contain all the information that may be important to you. For a complete description of the matters set forth in this "Description of Common Stock," you should refer to our amended and restated certificate of incorporation (the "Restated Certificate"), and amended and restated bylaws (the "Restated Bylaws"), which are included as exhibits to our Annual Report on Form 10-K, and to the applicable provisions of Delaware law. Our authorized capital stock consists of 200,000,000 shares of common stock, par value $0.001 per share, and 10,000,000 shares of undesignated preferred stock, par value $0.001 per share. Our board of directors is authorized, without stockholder approval except as required by the listing standards of The Nasdaq Stock Market LLC, to issue additional shares of our capital stock. In addition, our board of directors may, without further action by our stockholders, designate the rights, preferences, privileges, and restrictions of our preferred stock in one or more series.

Voting Rights

Our common stock is entitled to one vote for each share held of record on all matters submitted to a vote of the stockholders, including the election of directors, and does not have cumulative voting rights. Accordingly, the holders of a majority of the shares of our common stock entitled to vote in any election of directors can elect all of the directors standing for election.

Dividends

Subject to preferences that may be applicable to any then-outstanding preferred stock, the holders of common stock are entitled to receive dividends, if any, as may be declared from time to time by our board of directors out of legally available funds.

Liquidation

In the event of our liquidation, dissolution or winding-up, holders of our common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of our debts and other liabilities, subject to the satisfaction of any liquidation preference granted to the holders of any outstanding shares of preferred stock.

Rights and Preferences

Holders of our common stock have no preemptive, conversion or subscription rights, and there are no redemption or sinking fund provisions applicable to our common stock. The rights, preferences and privileges of the holders of our common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of our preferred stock that we may designate and issue in the future.

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is Computershare Trust Company, N.A.

Stock Exchange Listing

Our common stock is listed on the Nasdaq Global Select Market under the symbol "TOCA".

Anti-Takeover Provisions

Delaware Law

We are subject to Section 203 of the Delaware General Corporate Law ("DGCL"), which generally prohibits a public Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a period of three years after the date of the transaction in which the person became an interested stockholder, unless:

- prior to the date of the transaction, the board of directors of the corporation approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- the interested stockholder owned at least 85% of the voting stock of the corporation outstanding upon consummation of the transaction, excluding for purposes of determining the number of shares outstanding (1) shares owned by persons who are directors and also officers and (2) shares owned by employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- on or subsequent to the consummation of the transaction, the business combination is approved by the board and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least 66 2/3% of the outstanding voting stock which is not owned by the interested stockholder.

Section 203 of the DGCL defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder; and
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 of the DGCL defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

The statute could prohibit or delay mergers or other takeover or change in control attempts and, accordingly, may discourage attempts to acquire us even though such a transaction may offer our stockholders the opportunity to sell their stock at a price above the prevailing market price.

Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws Provisions

Provisions of our Restated Certificate and Restated Bylaws, may delay or discourage transactions involving an actual or potential change in our control or change in our management, including transactions in which stockholders might otherwise receive a premium for their shares or transactions that our stockholders might otherwise deem to be in their best interests. Therefore, these provisions could adversely affect the price of our common stock. Among other things, our Restated Certificate and Restated Bylaws:

- 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;
- provide that the authorized number of directors may be changed only by resolution adopted by a majority 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 or subject to the rights of holders of preferred stock as designated from time to time, 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 or electronic transmission;
- 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); and
- 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 (whether or not there exists any vacancies).

The amendment of any of these provisions, with the exception of the ability of our board of directors to issue shares of preferred stock and designate any rights, preferences and privileges thereto, would require the affirmative vote of the holders of at least 66 2/3% of the voting power of all of our then outstanding common stock.

The foregoing provisions may make it more difficult for our existing stockholders to replace our board of directors as well as for another party to obtain control of us by replacing our board of directors. Since our board of directors has the power to retain and discharge our officers, these provisions could also make it more difficult for existing stockholders or another party to effect a change in management. In addition, the authorization of undesignated preferred stock makes it possible for our board of directors to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change our control.

These provisions are intended to enhance the likelihood of continued stability in the composition of our board of directors and its policies and to discourage certain types of transactions that may involve an actual or threatened acquisition of us. These provisions are also designed to reduce our vulnerability to an unsolicited acquisition proposal and to discourage certain tactics that may be used in proxy fights. However, such provisions could have the effect of discouraging others from making tender offers for our shares and may have the effect of deterring hostile takeovers or delaying changes in our control or management. As a consequence, these provisions also may inhibit fluctuations in the market price of our stock that could result from actual or rumored takeover attempts.

Choice of Forum

Our Restated Bylaws provide that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware shall 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, officers or other employees to us or our stockholders; (iii) any action asserting a claim against us or any of our directors or officers or other employees arising pursuant to any provision of the DGCL, the Restated Certificate or Restated Bylaws; or (iv) any action asserting a claim against us or any of our directors or officers or other employees governed by the internal affairs doctrine. The enforceability of similar choice of forum provisions in other companies' bylaws has been challenged in legal proceedings, and it is possible that a court could find these types of provisions to be inapplicable or unenforceable. This choice of forum provision does not apply to suits brought to enforce a duty or liability created by the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended, or any other claim for which the federal courts have exclusive jurisdiction.

Exhibit 10.10

TOCAGEN INC.

SECOND AMENDED AND RESTATED EXECUTIVE EMPLOYMENT AGREEMENT

This Second Amended and Restated Executive Employment Agreement (the "***Agreement***") is made and entered into effective as of February 21, 2020 (the "***Effective Date***"), by and between Martin J. Duvall ("***Executive***") and Tocagen Inc. (the "***Company***").

This Agreement supersedes and replaces in their entirety all other or prior agreements, whether oral or written, with respect to Executive's employment terms with the Company or its affiliates or predecessors, including without limitation that certain Amended and Restated Executive Employment Agreement between Executive and the Company dated February 12, 2018 (the "***Prior Agreements***"). Executive agrees and acknowledges that this Agreement shall not constitute and shall not be deemed for any purpose to be a termination without Cause or a Good Reason resignation right, including for purposes of the Prior Agreements.

Now, Therefore, in consideration of the mutual promises and covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. Employment by the Company.

1.1 Position. Executive shall serve as the Company's Chief Executive Officer and shall report to the Company's Board of Directors (the "***Board***"). During the term of Executive's employment with the Company, Executive will devote Executive's best efforts and substantially all of Executive's business time and attention to the business of the Company, except for approved vacation periods and reasonable periods of illness or other incapacities permitted by the Company's general employment policies. Following the Effective Date, Executive shall initially continue to serve as a member of the Board. If Executive ceases to serve as an officer of the Company for any reason, then Executive will resign from his position as a member of the Board), if and as requested by the Board.

1.2 Duties and Location. Executive shall perform such duties as are customarily associated with the position of Chief Executive Officer and such other duties as are assigned to Executive by the Board. Executive's primary office location shall be the Company's headquarters located in San Diego, California. Subject to the terms of this Agreement, the Company reserves the right to (a) reasonably require Executive to perform Executive's duties at places other than Executive's primary office location from time to time and to require reasonable business travel, and (b) modify Executive's job title and duties as it deems necessary and appropriate in light of the Company's needs and interests from time to time.

1.3 Policies and Procedures. The employment relationship between the parties shall be governed by the general employment policies and practices of the Company, except that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or practices, this Agreement shall control.

2. Cash Compensation.

2.1 Base Salary. For services to be rendered hereunder, Executive shall receive a base salary at the rate of $515,000 per year (the "***Base Salary***"), less standard payroll deductions and withholdings and payable in accordance with the Company's regular payroll schedule. The Board (or the Compensation Committee thereof) may review Executive's Base Salary for adjustment from time to time.

2.2 Bonus. Executive will be eligible to be considered for a discretionary annual performance bonus of up to 50% of the Base Salary, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee thereof, including pursuant to an annual incentive plan or similar plan approved by the Board, if any. Any such bonus would be paid after the close of the fiscal year and after determination by the Board (or the Compensation Committee thereof) of (i) the level of achievement of the applicable individual and corporate performance targets, metrics and/or objectives and (ii) the amount of the annual incentive compensation earned by Executive (if any). No annual incentive compensation is guaranteed and, in addition to the other conditions for earning such compensation, Executive must remain an employee in good standing of the Company on the annual incentive compensation payment date in order to be eligible for any annual incentive compensation. The Board (or the Compensation Committee thereof) may review Executive's annual performance bonus amount for adjustment from time to time.

3. Standard Company Benefits. Executive shall, in accordance with Company policy and the terms and conditions of the applicable Company benefit plan documents, be eligible to participate in the benefit and fringe benefit programs provided by the Company to its executive officers and other employees from time to time. Any such benefits shall be subject to the terms and conditions of the governing benefit plans and policies and may be changed by the Company in its discretion.

4. Other Expenses. The Company will reimburse Executive for reasonable travel, entertainment or other expenses incurred by Executive in furtherance or in connection with the performance of Executive's duties hereunder, in accordance with the Company's expense reimbursement policy as in effect from time to time.

5. Equity Awards. All Company equity awards previously granted to Executive (such awards, the "***Prior Equity Awards***") shall continue in effect from and following the Effective Date in accordance with their existing terms. Executive may be eligible to receive additional grants of Company equity awards in the sole discretion of and subject to the approval of the Board.

6. Proprietary Information Obligations.

6.1 Proprietary Information Agreement. Executive will continue to abide by the Company's standard Confidential Information and Invention Assignment Agreement attached hereto as **Exhibit A** ("***Proprietary Agreement***").

6.2 Third-Party Agreements and Information. Executive represents and warrants that Executive's employment by the Company does not conflict with any prior employment or consulting agreement or other agreement with any third party, and that Executive

will perform Executive's duties to the Company without violating any such agreement. Executive represents and warrants that Executive does not possess confidential information arising out of prior employment, consulting, or other third party relationships, that would be used in connection with Executive's employment by the Company, except as expressly authorized by that third party. During Executive's employment by the Company, Executive will use in the performance of Executive's duties only information that is generally known and used by persons with training and experience comparable to Executive's own, common knowledge in the industry, otherwise legally in the public domain, or obtained or developed by the Company or by Executive in the course of Executive's work for the Company.

7. Outside Activities and Non-Competition and No-Solicit.

7.1 Outside Activities. Throughout Executive's employment with the Company, Executive may engage in civic and not-for-profit activities so long as such activities do not interfere with the performance of Executive's duties hereunder or present a conflict of interest with the Company or its affiliates. Subject to the restrictions set forth herein, and only with prior written disclosure to and consent of the Board, Executive may engage in other types of business or public activities. The Board may rescind such consent, if the Board determines, in its sole discretion, that such activities compromise or threaten to compromise the Company's or its affiliates' business interests or conflict with Executive's duties to the Company or its affiliates.

7.2 Non-Competition During Employment. Except as otherwise provided in this Agreement, during Executive's employment by the Company, Executive will not, without the express written consent of the Board, directly or indirectly serve as an officer, director, stockholder, employee, partner, proprietor, investor, joint venturer, associate, representative or consultant of any person or entity engaged in, or planning or preparing to engage in, business activity competitive with any line of business engaged in (or planned to be engaged in) by the Company or its affiliates; provided, however, that Executive may purchase or otherwise acquire up to (but not more than) one percent (1%) of any class of securities of any enterprise (without participating in the activities of such enterprise) if such securities are listed on any national or regional securities exchange. In addition, Executive will be subject to certain restrictions (including restrictions continuing after Executive's employment ends) under the terms of the Proprietary Agreement.

7.3 Non-Solicitation. Executive agrees that during the period of employment with the Company and for twelve (12) months after the date Executive's employment is terminated for any reason, Executive will not, either directly or through others, solicit or encourage or attempt to solicit or encourage any employee, independent contractor, or consultant of the Company to terminate his or her relationship with the Company in order to become an employee, consultant or independent contractor to or for any other person or entity.

8. Termination of Employment; Severance and Change in Control Benefits.

8.1 At-Will Employment. Executive's employment relationship is at-will. Either Executive or the Company may terminate the employment relationship at any time, with or without Cause (as defined below) or advance notice. In the event Executive's employment with the Company is terminated for any reason, Executive will be entitled to all of Executive's earned

compensation and benefits or otherwise as required by law through the date of termination. For the avoidance of doubt, Executive shall not be entitled to any additional compensation or benefits hereunder in the event Executive's employment is terminated for Cause, due to Executive's resignation without Good Reason, upon Executive's death or Executive's Disability (as defined below); *provided that* this Section 8.1 does not purport to alter (a) any separate agreement entered into after the Effective Date and pursuant which Executive is expressly entitled to benefits or other compensation on or after the events set forth in this sentence, including, if applicable, the Equity Documents, or (b) any agreements between the Executive and any third party, including insurance policies or the like. If Executive's employment terminates due to an Involuntary Termination (as defined below), Executive will be eligible to receive the additional compensation and benefits described in Sections 8.2 and 8.3, as applicable.

8.2 Termination Without Cause or Resignation for Good Reason Unrelated to Change in Control. If at any time except during the Change in Control Period (as defined below) (i) the Company terminates Executive's employment without Cause (as defined below and other than as a result of Executive's death or Disability), or (ii) Executive resigns for Good Reason (as defined below), and provided in any case such termination constitutes a "separation from service", as defined under Treasury Regulation Section 1.409A-1(h)) (a "***Separation from Service***") (such termination described in (i) or (ii), an "***Involuntary Termination***"), Executive shall be entitled to receive the following severance benefits, subject in all events to Executive's compliance with Section 8.4 below:

(i) Executive shall receive severance pay in the form of continuation of Executive's base salary in effect (ignoring any decrease that forms the basis for Executive's resignation for Good Reason, if applicable) on the effective date of Executive's Involuntary Termination for the first eighteen (18) months (the "***Severance Period***") after the date of such termination;

(ii) If Executive is eligible for and timely elects to continue Executive's health insurance coverage under the Company's group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent ("***COBRA***") following Executive's termination date, the Company will pay the COBRA group health insurance premiums for Executive and Executive's eligible dependents until the earliest of (A) the close of the Severance Period, (B) the expiration of Executive's eligibility for the continuation coverage under COBRA, or (C) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment. For purposes of this Section, references to COBRA premiums shall not include any amounts payable by Executive under a Section 125 health care reimbursement plan under the U.S. Internal Revenue Code. Notwithstanding the foregoing, if at any time the Company determines, in its sole discretion, that it cannot pay the COBRA premiums without potentially incurring financial costs or penalties under applicable law (including, without limitation, Section 2716 of the Public Health Service Act), then regardless of whether Executive elects continued health coverage under COBRA, and in lieu of providing the COBRA premiums, the Company will instead pay Executive on the last day of each remaining month of the Severance Period, a fully taxable cash payment equal to the COBRA premiums for that month, subject to applicable tax withholdings (such amount, the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA premiums would otherwise have been paid and shall be equal

to the amount that the Company would have otherwise paid for COBRA premiums, and shall be paid until the earlier of (i) expiration of the Severance Period or (ii) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment; and

(iii) Executive shall receive an extension of the period of time following which Executive may exercise vested shares subject to Executive's equity awards to purchase Company common stock that are outstanding immediately prior to Executive's Involuntary Termination until the date that is the earlier of (A) the original Expiration Date (as defined in the respective Equity Documents for such options) and (B) eighteen (18) months following the date of Involuntary Termination; provided, however, that Executive's rights to exercise vested options may terminate prior to such date, in accordance with the terms of the equity plan under which such options were granted (including upon a corporate transaction) or Executive's violation of the Proprietary Agreement or the Release (defined below).

8.3 Termination Without Cause or Resignation for Good Reason During Change in Control Period. In the event of an Involuntary Termination at any time during the time period commencing three (3) months immediately prior to the effective date of a Change in Control (as defined in the Company's 2017 Equity Incentive Plan (the "***Plan***")) and ending on the date that is twelve (12) months after the effective date of a Change in Control (the "***Change in Control Period***"), in addition to the payments and benefits described in Section 8.2, and subject in all events to Executive's compliance with Section 8.4 below, the Executive shall also be entitled to the following severance benefits:

(i) Notwithstanding anything to the contrary set forth in the Plan or any successor equity incentive plan or any award agreement, the vesting of all of Executive's then-outstanding stock awards, including any Prior Equity Awards, that are subject to time-based vesting shall be fully accelerated such that on the effective date of such termination one hundred percent (100%) of the shares subject to time-based vesting in such stock awards granted to Executive prior to the effective date of such termination shall be fully vested and immediately exercisable by Executive. Treatment of any performance-based vesting equity awards will be governed solely by the terms of the agreements under which such awards were granted and will not be eligible to accelerate vesting pursuant to the foregoing provision.

8.4 Conditions and Timing for Severance Benefits. The severance benefits set forth in Sections 8.2 and 8.3 above are expressly conditioned upon: (i) Executive's continuing to comply with Executive's obligations under Executive's Proprietary Agreement; and (ii) Executive signing and not revoking a general release of legal claims in the form provided by the Company which shall include a full general release of claims against the Company and related persons and entities and a commitment from Executive to comply with Executive's continuing obligations under Executive's Proprietary Agreement, but will not include a release of any rights or claims for indemnification Executive may have pursuant to any written indemnification agreement with the Company to which Executive is a party, the Company's bylaws, or applicable law (the "***Release***") within the applicable deadline set forth therein and permitting the Release to become effective in accordance with its terms, which must occur no later than forty-five (45) days following the date of termination (the "***Release Deadline***"). The salary continuation payments described in Section 8.2 will be paid in substantially equal installments on the Company's regular

payroll schedule and subject to standard deductions and withholdings over the Severance Period following termination; provided, however, that no payments will be made prior to the effectiveness of the Release. On the effective date of the Release, the Company will pay Executive the salary continuation payments that Executive would have received on or prior to such date in a lump sum under the original schedule but for the delay while waiting for the effectiveness of the release, with the balance of the cash severance being paid as originally scheduled.

8.5 Definitions. For purposes of this Agreement:

(i) "***Cause***" means, with respect to Executive, the occurrence of any of the following events: (i) Executive's commission of any felony or any crime involving fraud, dishonesty or moral turpitude under the laws of the United States or any state thereof; (ii) Executive's attempted commission of, or participation in, a fraud or act of dishonesty against the Company; (iii) Executive's intentional, material violation of any contract or agreement between Executive and the Company or of any statutory duty owed to the Company that has not been cured, if curable, within fifteen (15) days after written notice from the Board of such violation; (iv) Executive's unauthorized use or disclosure of the Company's confidential information or trade secrets; or (v) Executive's gross misconduct that has not been cured, if curable, within fifteen (15) days after written notice from the Board requesting that the Executive cure such misconduct.

(ii) ***"Disability"*** means the inability of Executive to engage in substantially gainful Company activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than twelve (12) months, and shall be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

(iii) "***Good Reason***" means Executive's resignation from employment with the Company (or successor to the Company, if applicable) due to any of the following actions taken by the Company (or successor to the Company, if applicable) without Executive's prior written consent thereto: (1) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (unless pursuant to a salary reduction program applicable generally to the Company's similarly situated employees); (2) a material reduction in Executive's authority, duties or responsibilities; (3) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation (excluding regular travel in the ordinary course of business); and (4) a breach of a material provision of this Agreement by the Company. *Notwithstanding the foregoing*, in order to resign for Good Reason, Executive must provide written notice to the Company within thirty (30) days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation and allow the Company at least thirty (30) days from receipt of such written notice to cure such event, and, if such event is not reasonably cured within such period, Executive's resignation from all positions Executive then holds with the Company is effective not later than thirty (30) days after the expiration of the cure period.

8.6 Section 409A. It is intended that all of the benefits and other payments payable under this Agreement satisfy, to the greatest extent possible, an exemption from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") and

the regulations and other guidance thereunder and any state law of similar effect (collectively ***"Section 409A"***), and this Agreement will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this Agreement (and any definitions hereunder) will be construed in a manner that complies with Section 409A, and any ambiguities herein shall be interpreted accordingly. Specifically, the benefits under this Agreement are intended to satisfy the exemptions from application of Section 409A provided under Treasury Regulations Sections 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9) and each installment of severance benefits is a separate "payment" for purposes of Treasury Regulations Section 1.409A-2(b)(2)(i). However, if such exemptions are not available and Executive is, upon Separation from Service, a "specified employee" for purposes of Section 409A, then, solely to the extent necessary to avoid adverse personal tax consequences under Section 409A, the timing of the severance benefits payments shall be delayed until the earlier of (i) six (6) months and one day after Executive's Separation from Service, or (ii) Executive's death. Severance benefits shall not commence until Executive has a Separation from Service. If the severance benefits are not covered by one or more exemptions from the application of Section 409A and the Release could become effective in the calendar year following the calendar year in which Executive's Separation from Service occurs, the Release will not be deemed effective, for purposes of payment of severance, any earlier than the Release Deadline. Except to the minimum extent that payments must be delayed because Executive is a "specified employee" or until the effectiveness of the Release, all severance amounts will be paid as soon as practicable in accordance with the Company's normal payroll practices.

8.7 Section 280G. If any payment or benefit Executive will or may receive from the Company or otherwise (a "***Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then such Payment will be equal to the Reduced Amount (defined below). The "***Reduced Amount***" will be either (l) the largest portion of the Payment that would result in no portion of the Payment (after reduction) being subject to the Excise Tax or (2) the entire Payment, whichever amount after taking into account all applicable federal, state and local employment taxes, income taxes, and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes), results in Executive's receipt, on an after-tax basis, of the greatest amount of the Payment. If a reduction in the Payment is to be made so that the Payment equals the Reduced Amount, (x) the Payment will be paid only to the extent permitted under the Reduced Amount alternative, and the Executive will have no rights to any additional payments and/or benefits constituting the Payment, and (y) reduction in payments and/or benefits will occur in the following order: (1) reduction of cash payments; (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits paid to Executive. In the event that acceleration of vesting of equity award compensation is to be reduced, such acceleration of vesting will be cancelled in the reverse order of the date of grant of Executive's equity awards. In no event will the Company or any stockholder be liable to Executive for any amounts not paid as a result of the operation of this Section. The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the change in control will perform the foregoing calculations. If the tax firm so engaged by the Company is serving as accountant or auditor for the acquirer, the Company will appoint a nationally recognized tax firm to make the determinations required hereunder. The Company will bear all expenses with respect to the determinations by such firm required to be made hereunder. If the tax firm determines that no Excise

Tax is payable with respect to a Payment, either before or after the application of the Reduced Amount, it will furnish the Company and Executive with documentation that no Excise Tax is reasonably likely to be imposed with respect to such Payment. Any good faith determinations of the tax firm made hereunder will be final, binding and conclusive upon the Company and Executive.

9. Dispute Resolution. To ensure the rapid and economical resolution of disputes that may arise in connection with Executive's employment with the Company, Executive and the Company agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, Executive's employment with the Company, or the termination of Executive's employment from the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Diego, California by JAMS, Inc. ("***JAMS***") or its successors, under JAMS' then applicable rules and procedures for employment disputes (which can be found at https://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to Executive on request); provided that the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. Executive and the Company shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. **Both Executive and the Company acknowledge that by agreeing to this arbitration procedure, they waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding**. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fee. Nothing in this Agreement is intended to prevent either the Company or Executive from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration.

10. General Provisions.

10.1 Notices. Any notices provided must be in writing and will be deemed effective upon the earlier of personal delivery (including personal delivery by fax) or the next day after sending by overnight carrier, to the Company at its primary office location and to Executive at the address as listed on the Company payroll.

10.2 Severability. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced in such jurisdiction to the extent possible in keeping with the intent of the Parties.

10.3 Waiver. Any waiver of any breach of any provisions of this Agreement must be in writing to be effective, and it shall not thereby be deemed to have waived any preceding or succeeding breach of the same or any other provision of this Agreement.

10.4 Complete Agreement. This Agreement, together with the Proprietary Agreement, and the Indemnification Agreement attached hereto as **Exhibit B**, constitutes the entire agreement between Executive and the Company with regard to the subject matter hereof and is the complete, final, and exclusive embodiment of the Company's and Executive's agreement with regard to this subject matter. This Agreement is entered into without reliance on any promise or representation, written or oral, other than those expressly contained herein, and it supersedes any other such promises, warranties or representations (including, but not limited to, the Prior Agreements). It cannot be modified or amended except in a writing signed by a duly authorized officer of the Company, with the exception of those changes expressly reserved to the Company's discretion in this Agreement.

10.5 Counterparts. This Agreement may be executed in separate counterparts, any one of which need not contain signatures of more than one party, but both of which taken together will constitute one and the same Agreement.

10.6 Headings. The headings of the paragraphs hereof are inserted for convenience only and shall not be deemed to constitute a part hereof nor to affect the meaning thereof.

10.7 Successors and Assigns. This Agreement is intended to bind and inure to the benefit of and be enforceable by Executive and the Company, and their respective successors, assigns, heirs, executors and administrators, except that Executive may not assign any of Executive's duties hereunder and Executive may not assign any of Executive's rights hereunder without the written consent of the Company, which shall not be withheld unreasonably.

10.8 Tax Withholding. All payments and awards contemplated or made pursuant to this Agreement will be subject to withholdings of applicable taxes in compliance with all relevant laws and regulations of all appropriate government authorities. Executive acknowledges and agrees that the Company has neither made any assurances nor any guarantees concerning the tax treatment of any payments or awards contemplated by or made pursuant to this Agreement. Executive has had the opportunity to retain a tax and financial advisor and fully understands the tax and economic consequences of all payments and awards made pursuant to the Agreement.

10.9 Choice of Law. All questions concerning the construction, validity and interpretation of this Agreement will be governed by the laws of the State of California.

[Signature Page Follows]

In Witness Whereof, the parties have executed this Agreement on the date first written above.

Tocagen Inc.

By: /s/ Faheem Hasnain
Faheem Hasnain
Chairman of the Board

Executive

/s/ Martin J. Duvall
Martin J. Duvall

Exhibit A

Proprietary Agreement

11.

EXHIBIT B

INDEMNIFICATION AGREEMENT

12.

TOCAGEN INC.

SECOND AMENDED AND RESTATED EXECUTIVE EMPLOYMENT AGREEMENT

This Second Amended and Restated Executive Employment Agreement (the "***Agreement***") is made and entered into effective as of February 21, 2020 (the "***Effective Date***"), by and between Mark G. Foletta ("***Executive***") and Tocagen Inc. (the "***Company***").

This Agreement supersedes and replaces in their entirety all other or prior agreements, whether oral or written, with respect to Executive's employment terms with the Company or its affiliates or predecessors, including without limitation that certain Amended and Restated Executive Employment Agreement between Executive and the Company dated February 12, 2018 (the "***Prior Agreements***"). Executive agrees and acknowledges that this Agreement shall not constitute and shall not be deemed for any purpose to be a termination without Cause or a Good Reason resignation right, including for purposes of the Prior Agreements.

Now, Therefore, in consideration of the mutual promises and covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. Employment by the Company.

1.1 Position. Executive shall serve as the Company's Executive Vice President, Chief Financial Officer and shall report to the Company's Chief Executive Officer. During the term of Executive's employment with the Company, Executive will devote Executive's best efforts and substantially all of Executive's business time and attention to the business of the Company, except for approved vacation periods and reasonable periods of illness or other incapacities permitted by the Company's general employment policies.

1.2 Duties and Location. Executive shall perform such duties as are customarily associated with the position of Executive Vice President, Chief Financial Officer and such other duties as are assigned to Executive by the Company's Chief Executive Officer. Executive's primary office location shall be the Company's headquarters located in San Diego, California. Subject to the terms of this Agreement, the Company reserves the right to (a) reasonably require Executive to perform Executive's duties at places other than Executive's primary office location from time to time and to require reasonable business travel, and (b) modify Executive's job title and duties as it deems necessary and appropriate in light of the Company's needs and interests from time to time.

1.3 Policies and Procedures. The employment relationship between the parties shall be governed by the general employment policies and practices of the Company, except that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or practices, this Agreement shall control.

2. Cash Compensation.

2.1 Base Salary. For services to be rendered hereunder, Executive shall receive a base salary at the rate of $390,000 per year (the "***Base Salary***"), less standard payroll deductions

and withholdings and payable in accordance with the Company's regular payroll schedule. The Company's Board of Directors (the "***Board***") (or the Compensation Committee thereof) may review Executive's Base Salary for adjustment from time to time.

2.2 Bonus. Executive will be eligible to be considered for a discretionary annual performance bonus of up to 40% of the Base Salary, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee thereof, including pursuant to an annual incentive plan or similar plan approved by the Board, if any. Any such bonus would be paid after the close of the fiscal year and after determination by the Board (or the Compensation Committee thereof) of (i) the level of achievement of the applicable individual and corporate performance targets, metrics and/or objectives and (ii) the amount of the annual incentive compensation earned by Executive (if any). No annual incentive compensation is guaranteed and, in addition to the other conditions for earning such compensation, Executive must remain an employee in good standing of the Company on the annual incentive compensation payment date in order to be eligible for any annual incentive compensation. The Board (or the Compensation Committee thereof) may review Executive's annual performance bonus amount for adjustment from time to time.

3. Standard Company Benefits. Executive shall, in accordance with Company policy and the terms and conditions of the applicable Company benefit plan documents, be eligible to participate in the benefit and fringe benefit programs provided by the Company to its executive officers and other employees from time to time. Any such benefits shall be subject to the terms and conditions of the governing benefit plans and policies and may be changed by the Company in its discretion.

4. Other Expenses. The Company will reimburse Executive for reasonable travel, entertainment or other expenses incurred by Executive in furtherance or in connection with the performance of Executive's duties hereunder, in accordance with the Company's expense reimbursement policy as in effect from time to time.

5. Equity Awards. All Company equity awards previously granted to Executive (such awards, the "***Prior Equity Awards***") shall continue in effect from and following the Effective Date in accordance with their existing terms. Executive may be eligible to receive additional grants of Company equity awards in the sole discretion of and subject to the approval of the Board.

6. Proprietary Information Obligations.

6.1 Proprietary Information Agreement. Executive will continue to abide by the Company's standard Confidential Information and Invention Assignment Agreement attached hereto as **Exhibit A** ("***Proprietary Agreement***").

6.2 Third-Party Agreements and Information. Executive represents and warrants that Executive's employment by the Company does not conflict with any prior employment or consulting agreement or other agreement with any third party, and that Executive will perform Executive's duties to the Company without violating any such agreement. Executive represents and warrants that Executive does not possess confidential information arising out of prior employment, consulting, or other third party relationships, that would be used in connection

with Executive's employment by the Company, except as expressly authorized by that third party. During Executive's employment by the Company, Executive will use in the performance of Executive's duties only information that is generally known and used by persons with training and experience comparable to Executive's own, common knowledge in the industry, otherwise legally in the public domain, or obtained or developed by the Company or by Executive in the course of Executive's work for the Company.

7. Outside Activities and Non-Competition and No-Solicit.

7.1 Outside Activities. Throughout Executive's employment with the Company, Executive may engage in civic and not-for-profit activities so long as such activities do not interfere with the performance of Executive's duties hereunder or present a conflict of interest with the Company or its affiliates. Subject to the restrictions set forth herein, and only with prior written disclosure to and consent of the Board, Executive may engage in other types of business or public activities (and, for the avoidance of doubt, the activities listed on ANNEX I attached hereto are deemed disclosed to, and consented by, the Board). The Board may rescind such consent, if the Board determines, in its sole discretion, that such activities compromise or threaten to compromise the Company's or its affiliates' business interests or conflict with Executive's duties to the Company or its affiliates.

7.2 Non-Competition During Employment. Except as otherwise provided in this Agreement, during Executive's employment by the Company, Executive will not, without the express written consent of the Board, directly or indirectly serve as an officer, director, stockholder, employee, partner, proprietor, investor, joint venturer, associate, representative or consultant of any person or entity engaged in, or planning or preparing to engage in, business activity competitive with any line of business engaged in (or planned to be engaged in) by the Company or its affiliates; provided, however, that Executive may purchase or otherwise acquire up to (but not more than) one percent (1%) of any class of securities of any enterprise (without participating in the activities of such enterprise) if such securities are listed on any national or regional securities exchange. In addition, Executive will be subject to certain restrictions (including restrictions continuing after Executive's employment ends) under the terms of the Proprietary Agreement.

7.3 Non-Solicitation. Executive agrees that during the period of employment with the Company and for twelve (12) months after the date Executive's employment is terminated for any reason, Executive will not, either directly or through others, solicit or encourage or attempt to solicit or encourage any employee, independent contractor, or consultant of the Company to terminate his or her relationship with the Company in order to become an employee, consultant or independent contractor to or for any other person or entity.

8. Termination of Employment; Severance and Change in Control Benefits.

8.1 At-Will Employment. Executive's employment relationship is at-will. Either Executive or the Company may terminate the employment relationship at any time, with or without Cause (as defined below) or advance notice. In the event Executive's employment with the Company is terminated for any reason, Executive will be entitled to all of Executive's earned compensation and benefits or otherwise as required by law through the date of termination. For

the avoidance of doubt, Executive shall not be entitled to any additional compensation or benefits hereunder in the event Executive's employment is terminated for Cause, due to Executive's resignation without Good Reason, upon Executive's death or Executive's Disability (as defined below); *provided that* this Section 8.1 does not purport to alter (a) any separate agreement entered into after the Effective Date and pursuant which Executive is expressly entitled to benefits or other compensation on or after the events set forth in this sentence, including, if applicable, the Equity Documents, or (b) any agreements between the Executive and any third party, including insurance policies or the like. If Executive's employment terminates due to an Involuntary Termination (as defined below), Executive will be eligible to receive the additional compensation and benefits described in Sections 8.2 and 8.3, as applicable.

8.2 Termination Without Cause or Resignation for Good Reason Unrelated to Change in Control. If at any time except during the Change in Control Period (as defined below) (i) the Company terminates Executive's employment without Cause (as defined below and other than as a result of Executive's death or Disability), or (ii) Executive resigns for Good Reason (as defined below), and provided in any case such termination constitutes a "separation from service", as defined under Treasury Regulation Section 1.409A-1(h)) (a "***Separation from Service***") (such termination described in (i) or (ii), an "***Involuntary Termination***"), Executive shall be entitled to receive the following severance benefits, subject in all events to Executive's compliance with Section 8.4 below:

(i) Executive shall receive severance pay in the form of continuation of Executive's base salary in effect (ignoring any decrease that forms the basis for Executive's resignation for Good Reason, if applicable) on the effective date of Executive's Involuntary Termination for the first twelve (12) months (the "***Severance Period***") after the date of such termination;

(ii) If Executive is eligible for and timely elects to continue Executive's health insurance coverage under the Company's group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent ("***COBRA***") following Executive's termination date, the Company will pay the COBRA group health insurance premiums for Executive and Executive's eligible dependents until the earliest of (A) the close of the Severance Period, (B) the expiration of Executive's eligibility for the continuation coverage under COBRA, or (C) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment. For purposes of this Section, references to COBRA premiums shall not include any amounts payable by Executive under a Section 125 health care reimbursement plan under the U.S. Internal Revenue Code. Notwithstanding the foregoing, if at any time the Company determines, in its sole discretion, that it cannot pay the COBRA premiums without potentially incurring financial costs or penalties under applicable law (including, without limitation, Section 2716 of the Public Health Service Act), then regardless of whether Executive elects continued health coverage under COBRA, and in lieu of providing the COBRA premiums, the Company will instead pay Executive on the last day of each remaining month of the Severance Period, a fully taxable cash payment equal to the COBRA premiums for that month, subject to applicable tax withholdings (such amount, the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA premiums would otherwise have been paid and shall be equal to the amount that the Company would have otherwise paid for COBRA premiums, and shall be

paid until the earlier of (i) expiration of the Severance Period or (ii) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment; and

(iii) Executive shall receive an extension of the period of time following which Executive may exercise vested shares subject to Executive's equity awards to purchase Company common stock that are outstanding immediately prior to Executive's Involuntary Termination until the date that is the earlier of (A) the original Expiration Date (as defined in the respective Equity Documents for such options) and (B) twelve (12) months following the date of Involuntary Termination; provided, however, that Executive's rights to exercise vested options may terminate prior to such date, in accordance with the terms of the equity plan under which such options were granted (including upon a corporate transaction) or Executive's violation of the Proprietary Agreement or the Release (defined below).

8.3 Termination Without Cause or Resignation for Good Reason During Change in Control Period. In the event of an Involuntary Termination at any time during the time period commencing three (3) months immediately prior to the effective date of a Change in Control (as defined in the Company's 2017 Equity Incentive Plan (the "***Plan***")) and ending on the date that is twelve (12) months after the effective date of a Change in Control (the "***Change in Control Period***"), in addition to the payments and benefits described in Section 8.2, and subject in all events to Executive's compliance with Section 8.4 below, the Executive shall also be entitled to the following severance benefits:

(i) Notwithstanding anything to the contrary set forth in the Plan or any successor equity incentive plan or any award agreement, the vesting of all of Executive's then-outstanding stock awards, including any Prior Equity Awards, that are subject to time-based vesting shall be fully accelerated such that on the effective date of such termination one hundred percent (100%) of the shares subject to time-based vesting in such stock awards granted to Executive prior to the effective date of such termination shall be fully vested and immediately exercisable by Executive. Treatment of any performance-based vesting equity awards will be governed solely by the terms of the agreements under which such awards were granted and will not be eligible to accelerate vesting pursuant to the foregoing provision.

8.4 Conditions and Timing for Severance Benefits. The severance benefits set forth in Sections 8.2 and 8.3 above are expressly conditioned upon: (i) Executive's continuing to comply with Executive's obligations under Executive's Proprietary Agreement; and (ii) Executive signing and not revoking a general release of legal claims in the form provided by the Company which shall include a full general release of claims against the Company and related persons and entities and a commitment from Executive to comply with Executive's continuing obligations under Executive's Proprietary Agreement, but will not include a release of any rights or claims for indemnification Executive may have pursuant to any written indemnification agreement with the Company to which Executive is a party, the Company's bylaws, or applicable law (the "***Release***") within the applicable deadline set forth therein and permitting the Release to become effective in accordance with its terms, which must occur no later than forty-five (45) days following the date of termination (the "***Release Deadline***"). The salary continuation payments described in Section 8.2 will be paid in substantially equal installments on the Company's regular payroll schedule and subject to standard deductions and withholdings over the Severance Period

following termination; provided, however, that no payments will be made prior to the effectiveness of the Release. On the effective date of the Release, the Company will pay Executive the salary continuation payments that Executive would have received on or prior to such date in a lump sum under the original schedule but for the delay while waiting for the effectiveness of the release, with the balance of the cash severance being paid as originally scheduled.

8.5 Definitions. For purposes of this Agreement:

(i) "***Cause***" means, with respect to Executive, the occurrence of any of the following events: (i) Executive's commission of any felony or any crime involving fraud, dishonesty or moral turpitude under the laws of the United States or any state thereof; (ii) Executive's attempted commission of, or participation in, a fraud or act of dishonesty against the Company; (iii) Executive's intentional, material violation of any contract or agreement between Executive and the Company or of any statutory duty owed to the Company that has not been cured, if curable, within fifteen (15) days after written notice from the Board of such violation; (iv) Executive's unauthorized use or disclosure of the Company's confidential information or trade secrets; or (v) Executive's gross misconduct that has not been cured, if curable, within fifteen (15) days after written notice from the Board requesting that the Executive cure such misconduct.

(ii) ***"Disability"*** means the inability of Executive to engage in substantially gainful Company activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than twelve (12) months, and shall be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

(iii) "***Good Reason***" means Executive's resignation from employment with the Company (or successor to the Company, if applicable) due to any of the following actions taken by the Company (or successor to the Company, if applicable) without Executive's prior written consent thereto: (1) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (unless pursuant to a salary reduction program applicable generally to the Company's similarly situated employees); (2) a material reduction in Executive's authority, duties or responsibilities; (3) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation (excluding regular travel in the ordinary course of business); and (4) a breach of a material provision of this Agreement by the Company. *Notwithstanding the foregoing*, in order to resign for Good Reason, Executive must provide written notice to the Company within thirty (30) days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation and allow the Company at least thirty (30) days from receipt of such written notice to cure such event, and, if such event is not reasonably cured within such period, Executive's resignation from all positions Executive then holds with the Company is effective not later than thirty (30) days after the expiration of the cure period.

8.6 Section 409A. It is intended that all of the benefits and other payments payable under this Agreement satisfy, to the greatest extent possible, an exemption from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") and the regulations and other guidance thereunder and any state law of similar effect (collectively

"Section 409A"), and this Agreement will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this Agreement (and any definitions hereunder) will be construed in a manner that complies with Section 409A, and any ambiguities herein shall be interpreted accordingly. Specifically, the benefits under this Agreement are intended to satisfy the exemptions from application of Section 409A provided under Treasury Regulations Sections 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9) and each installment of severance benefits is a separate "payment" for purposes of Treasury Regulations Section 1.409A-2(b)(2)(i). However, if such exemptions are not available and Executive is, upon Separation from Service, a "specified employee" for purposes of Section 409A, then, solely to the extent necessary to avoid adverse personal tax consequences under Section 409A, the timing of the severance benefits payments shall be delayed until the earlier of (i) six (6) months and one day after Executive's Separation from Service, or (ii) Executive's death. Severance benefits shall not commence until Executive has a Separation from Service. If the severance benefits are not covered by one or more exemptions from the application of Section 409A and the Release could become effective in the calendar year following the calendar year in which Executive's Separation from Service occurs, the Release will not be deemed effective, for purposes of payment of severance, any earlier than the Release Deadline. Except to the minimum extent that payments must be delayed because Executive is a "specified employee" or until the effectiveness of the Release, all severance amounts will be paid as soon as practicable in accordance with the Company's normal payroll practices.

8.7 Section 280G. If any payment or benefit Executive will or may receive from the Company or otherwise (a "***Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then such Payment will be equal to the Reduced Amount (defined below). The "***Reduced Amount***" will be either (l) the largest portion of the Payment that would result in no portion of the Payment (after reduction) being subject to the Excise Tax or (2) the entire Payment, whichever amount after taking into account all applicable federal, state and local employment taxes, income taxes, and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes), results in Executive's receipt, on an after-tax basis, of the greatest amount of the Payment. If a reduction in the Payment is to be made so that the Payment equals the Reduced Amount, (x) the Payment will be paid only to the extent permitted under the Reduced Amount alternative, and the Executive will have no rights to any additional payments and/or benefits constituting the Payment, and (y) reduction in payments and/or benefits will occur in the following order: (1) reduction of cash payments; (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits paid to Executive. In the event that acceleration of vesting of equity award compensation is to be reduced, such acceleration of vesting will be cancelled in the reverse order of the date of grant of Executive's equity awards. In no event will the Company or any stockholder be liable to Executive for any amounts not paid as a result of the operation of this Section. The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the change in control will perform the foregoing calculations. If the tax firm so engaged by the Company is serving as accountant or auditor for the acquirer, the Company will appoint a nationally recognized tax firm to make the determinations required hereunder. The Company will bear all expenses with respect to the determinations by such firm required to be made hereunder. If the tax firm determines that no Excise Tax is payable

with respect to a Payment, either before or after the application of the Reduced Amount, it will furnish the Company and Executive with documentation that no Excise Tax is reasonably likely to be imposed with respect to such Payment. Any good faith determinations of the tax firm made hereunder will be final, binding and conclusive upon the Company and Executive.

9. Dispute Resolution. To ensure the rapid and economical resolution of disputes that may arise in connection with Executive's employment with the Company, Executive and the Company agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, Executive's employment with the Company, or the termination of Executive's employment from the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Diego, California by JAMS, Inc. ("***JAMS***") or its successors, under JAMS' then applicable rules and procedures for employment disputes (which can be found at https://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to Executive on request); provided that the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. Executive and the Company shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. **Both Executive and the Company acknowledge that by agreeing to this arbitration procedure, they waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding**. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fee. Nothing in this Agreement is intended to prevent either the Company or Executive from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration.

10. General Provisions.

10.1 Notices. Any notices provided must be in writing and will be deemed effective upon the earlier of personal delivery (including personal delivery by fax) or the next day after sending by overnight carrier, to the Company at its primary office location and to Executive at the address as listed on the Company payroll.

10.2 Severability. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced in such jurisdiction to the extent possible in keeping with the intent of the Parties.

10.3 Waiver. Any waiver of any breach of any provisions of this Agreement must be in writing to be effective, and it shall not thereby be deemed to have waived any preceding or succeeding breach of the same or any other provision of this Agreement.

10.4 Complete Agreement. This Agreement, together with the Proprietary Agreement, and the Indemnification Agreement attached hereto as **Exhibit B**, constitutes the entire agreement between Executive and the Company with regard to the subject matter hereof and is the complete, final, and exclusive embodiment of the Company's and Executive's agreement with regard to this subject matter. This Agreement is entered into without reliance on any promise or representation, written or oral, other than those expressly contained herein, and it supersedes any other such promises, warranties or representations (including, but not limited to, the Prior Agreements). It cannot be modified or amended except in a writing signed by a duly authorized officer of the Company, with the exception of those changes expressly reserved to the Company's discretion in this Agreement.

10.5 Counterparts. This Agreement may be executed in separate counterparts, any one of which need not contain signatures of more than one party, but both of which taken together will constitute one and the same Agreement.

10.6 Headings. The headings of the paragraphs hereof are inserted for convenience only and shall not be deemed to constitute a part hereof nor to affect the meaning thereof.

10.7 Successors and Assigns. This Agreement is intended to bind and inure to the benefit of and be enforceable by Executive and the Company, and their respective successors, assigns, heirs, executors and administrators, except that Executive may not assign any of Executive's duties hereunder and Executive may not assign any of Executive's rights hereunder without the written consent of the Company, which shall not be withheld unreasonably.

10.8 Tax Withholding. All payments and awards contemplated or made pursuant to this Agreement will be subject to withholdings of applicable taxes in compliance with all relevant laws and regulations of all appropriate government authorities. Executive acknowledges and agrees that the Company has neither made any assurances nor any guarantees concerning the tax treatment of any payments or awards contemplated by or made pursuant to this Agreement. Executive has had the opportunity to retain a tax and financial advisor and fully understands the tax and economic consequences of all payments and awards made pursuant to the Agreement.

10.9 Choice of Law. All questions concerning the construction, validity and interpretation of this Agreement will be governed by the laws of the State of California.

[Signature Page Follows]

In Witness Whereof, the parties have executed this Agreement on the date first written above.

Tocagen Inc.

By: /s/ Martin J. Duvall
Martin J. Duvall
Chief Executive Officer

Executive

/s/ Mark Foletta
Mark Foletta

- AMN Healthcare Services, Inc. – member of the board of directors and chairman of the audit committee
- Dexcom, Inc. – lead director of the board of directors and chairman of the audit committee
- Viacyte, Inc. – member of the board of directors and chairman of the audit committee

Exhibit A

Proprietary Agreement

12.

EXHIBIT B

INDEMNIFICATION AGREEMENT

220649348 v1

TOCAGEN INC.

AMENDED AND RESTATED EXECUTIVE EMPLOYMENT AGREEMENT

This Amended and Restated Executive Employment Agreement (the "***Agreement***") is made and entered into effective as of February 21, 2020 (the "***Effective Date***"), by and between Douglas J. Jolly, Ph.D. ("***Executive***") and Tocagen Inc. (the "***Company***").

This Agreement supersedes and replaces in their entirety all other or prior agreements, whether oral or written, with respect to Executive's employment terms with the Company or its affiliates or predecessors, including without limitation that certain Executive Employment Agreement between Executive and the Company dated February 12, 2018 (the "***Prior Agreements***"). Executive agrees and acknowledges that this Agreement shall not constitute and shall not be deemed for any purpose to be a termination without Cause or a Good Reason resignation right, including for purposes of the Prior Agreements.

Whereas, the Company and Executive desire to enter into this Agreement to define their mutual rights and duties with respect to Executive's compensation and benefits.

Now, Therefore, in consideration of the mutual promises and covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. Employment by the Company.

1.1 Position. Executive shall serve as the Company's Executive Vice President, Research and Pharmaceutical Development and shall report to the Company's Chief Executive Officer. During the term of Executive's employment with the Company, Executive will devote Executive's best efforts and substantially all of Executive's business time and attention to the business of the Company, except for approved vacation periods and reasonable periods of illness or other incapacities permitted by the Company's general employment policies.

1.2 Duties and Location. Executive shall perform such duties as are customarily associated with the position of Executive Vice President, Research and Pharmaceutical Development and such other duties as are assigned to Executive by the Company's Chief Executive Officer. Executive's primary office location shall be the Company's headquarters located in San Diego, California. Subject to the terms of this Agreement, the Company reserves the right to (a) reasonably require Executive to perform Executive's duties at places other than Executive's primary office location from time to time and to require reasonable business travel, and (b) modify Executive's job title and duties as it deems necessary and appropriate in light of the Company's needs and interests from time to time.

1.3 Policies and Procedures. The employment relationship between the parties shall be governed by the general employment policies and practices of the Company, except that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or practices, this Agreement shall control.

2. Cash Compensation.

2.1 Base Salary. For services to be rendered hereunder, Executive shall receive a base salary at the rate of $300,000 per year (the "***Base Salary***"), less standard payroll deductions and withholdings and payable in accordance with the Company's regular payroll schedule. The Company's Board of Directors (the "***Board***") (or the Compensation Committee thereof) may review Executive's Base Salary for adjustment from time to time.

2.2 Bonus. Executive will be eligible to be considered for a discretionary annual performance bonus of up to 40% of the Base Salary, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee thereof, including pursuant to an annual incentive plan or similar plan approved by the Board, if any. Any such bonus would be paid after the close of the fiscal year and after determination by the Board (or the Compensation Committee thereof) of (i) the level of achievement of the applicable individual and corporate performance targets, metrics and/or objectives and (ii) the amount of the annual incentive compensation earned by Executive (if any). No annual incentive compensation is guaranteed and, in addition to the other conditions for earning such compensation, Executive must remain an employee in good standing of the Company on the annual incentive compensation payment date in order to be eligible for any annual incentive compensation. The Board (or the Compensation Committee thereof) may review Executive's annual performance bonus amount for adjustment from time to time.

3. Standard Company Benefits. Executive shall, in accordance with Company policy and the terms and conditions of the applicable Company benefit plan documents, be eligible to participate in the benefit and fringe benefit programs provided by the Company to its executive officers and other employees from time to time. Any such benefits shall be subject to the terms and conditions of the governing benefit plans and policies and may be changed by the Company in its discretion.

4. Other Expenses. The Company will reimburse Executive for reasonable travel, entertainment or other expenses incurred by Executive in furtherance or in connection with the performance of Executive's duties hereunder, in accordance with the Company's expense reimbursement policy as in effect from time to time.

5. Equity Awards. All Company equity awards previously granted to Executive (such awards, the "***Prior Equity Awards***") shall continue in effect from and following the Effective Date in accordance with their existing terms. Executive may be eligible to receive additional grants of Company equity awards in the sole discretion of and subject to the approval of the Board.

6. Proprietary Information Obligations.

6.1 Proprietary Information Agreement. Executive will continue to abide by the Company's standard Confidential Information and Invention Assignment Agreement attached hereto as **Exhibit A** ("***Proprietary Agreement***").

6.2 Third-Party Agreements and Information. Executive represents and warrants that Executive's employment by the Company does not conflict with any prior employment or consulting agreement or other agreement with any third party, and that Executive

will perform Executive's duties to the Company without violating any such agreement. Executive represents and warrants that Executive does not possess confidential information arising out of prior employment, consulting, or other third party relationships, that would be used in connection with Executive's employment by the Company, except as expressly authorized by that third party. During Executive's employment by the Company, Executive will use in the performance of Executive's duties only information that is generally known and used by persons with training and experience comparable to Executive's own, common knowledge in the industry, otherwise legally in the public domain, or obtained or developed by the Company or by Executive in the course of Executive's work for the Company.

7. Outside Activities and Non-Competition and No-Solicit.

7.1 Outside Activities. Throughout Executive's employment with the Company, Executive may engage in civic and not-for-profit activities so long as such activities do not interfere with the performance of Executive's duties hereunder or present a conflict of interest with the Company or its affiliates. Subject to the restrictions set forth herein, and only with prior written disclosure to and consent of the Board, Executive may engage in other types of business or public activities. The Board may rescind such consent, if the Board determines, in its sole discretion, that such activities compromise or threaten to compromise the Company's or its affiliates' business interests or conflict with Executive's duties to the Company or its affiliates.

7.2 Non-Competition During Employment. Except as otherwise provided in this Agreement, during Executive's employment by the Company, Executive will not, without the express written consent of the Board, directly or indirectly serve as an officer, director, stockholder, employee, partner, proprietor, investor, joint venturer, associate, representative or consultant of any person or entity engaged in, or planning or preparing to engage in, business activity competitive with any line of business engaged in (or planned to be engaged in) by the Company or its affiliates; provided, however, that Executive may purchase or otherwise acquire up to (but not more than) one percent (1%) of any class of securities of any enterprise (without participating in the activities of such enterprise) if such securities are listed on any national or regional securities exchange. In addition, Executive will be subject to certain restrictions (including restrictions continuing after Executive's employment ends) under the terms of the Proprietary Agreement.

7.3 Non-Solicitation. Executive agrees that during the period of employment with the Company and for twelve (12) months after the date Executive's employment is terminated for any reason, Executive will not, either directly or through others, solicit or encourage or attempt to solicit or encourage any employee, independent contractor, or consultant of the Company to terminate his or her relationship with the Company in order to become an employee, consultant or independent contractor to or for any other person or entity.

8. Termination of Employment; Severance and Change in Control Benefits.

8.1 At-Will Employment. Executive's employment relationship is at-will. Either Executive or the Company may terminate the employment relationship at any time, with or without Cause (as defined below) or advance notice. In the event Executive's employment with the Company is terminated for any reason, Executive will be entitled to all of Executive's earned

compensation and benefits or otherwise as required by law through the date of termination. For the avoidance of doubt, Executive shall not be entitled to any additional compensation or benefits hereunder in the event Executive's employment is terminated for Cause, due to Executive's resignation without Good Reason, upon Executive's death or Executive's Disability (as defined below); *provided that* this Section 8.1 does not purport to alter (a) any separate agreement entered into after the Effective Date and pursuant which Executive is expressly entitled to benefits or other compensation on or after the events set forth in this sentence, including, if applicable, the Equity Documents, or (b) any agreements between the Executive and any third party, including insurance policies or the like. If Executive's employment terminates due to an Involuntary Termination (as defined below), Executive will be eligible to receive the additional compensation and benefits described in Sections 8.2 and 8.3, as applicable.

8.2 Termination Without Cause or Resignation for Good Reason Unrelated to Change in Control. If at any time except during the Change in Control Period (as defined below) (i) the Company terminates Executive's employment without Cause (as defined below and other than as a result of Executive's death or Disability), or (ii) Executive resigns for Good Reason (as defined below), and provided in any case such termination constitutes a "separation from service", as defined under Treasury Regulation Section 1.409A-1(h)) (a "***Separation from Service***") (such termination described in (i) or (ii), an "***Involuntary Termination***"), Executive shall be entitled to receive the following severance benefits, subject in all events to Executive's compliance with Section 8.4 below:

(i) Executive shall receive severance pay in the form of continuation of Executive's base salary in effect (ignoring any decrease that forms the basis for Executive's resignation for Good Reason, if applicable) on the effective date of Executive's Involuntary Termination for the first nine (9) months (the "***Severance Period***") after the date of such termination; and

(ii) If Executive is eligible for and timely elects to continue Executive's health insurance coverage under the Company's group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent ("***COBRA***") following Executive's termination date, the Company will pay the COBRA group health insurance premiums for Executive and Executive's eligible dependents until the earliest of (A) the close of the Severance Period, (B) the expiration of Executive's eligibility for the continuation coverage under COBRA, or (C) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment. For purposes of this Section, references to COBRA premiums shall not include any amounts payable by Executive under a Section 125 health care reimbursement plan under the U.S. Internal Revenue Code. Notwithstanding the foregoing, if at any time the Company determines, in its sole discretion, that it cannot pay the COBRA premiums without potentially incurring financial costs or penalties under applicable law (including, without limitation, Section 2716 of the Public Health Service Act), then regardless of whether Executive elects continued health coverage under COBRA, and in lieu of providing the COBRA premiums, the Company will instead pay Executive on the last day of each remaining month of the Severance Period, a fully taxable cash payment equal to the COBRA premiums for that month, subject to applicable tax withholdings (such amount, the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA premiums would otherwise have been paid and shall be equal

to the amount that the Company would have otherwise paid for COBRA premiums, and shall be paid until the earlier of (i) expiration of the Severance Period or (ii) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment.

8.3 Termination Without Cause or Resignation for Good Reason During Change in Control Period. In the event of an Involuntary Termination at any time during the time period commencing three (3) months immediately prior to the effective date of a Change in Control (as defined in the Company's 2017 Equity Incentive Plan (the "***Plan***")) and ending on the date that is twelve (12) months after the effective date of a Change in Control (the "***Change in Control Period***"), in addition to the payments and benefits described in Section 8.2, and subject in all events to Executive's compliance with Section 8.4 below, the Executive shall also be entitled to the following severance benefits:

(i) Notwithstanding anything to the contrary set forth in the Plan or any successor equity incentive plan or any award agreement, the vesting of all of Executive's then-outstanding stock awards, including any Prior Equity Awards, that are subject to time-based vesting shall be fully accelerated such that on the effective date of such termination one hundred percent (100%) of the shares subject to time-based vesting in such stock awards granted to Executive prior to the effective date of such termination shall be fully vested and immediately exercisable by Executive. Treatment of any performance-based vesting equity awards will be governed solely by the terms of the agreements under which such awards were granted and will not be eligible to accelerate vesting pursuant to the foregoing provision.

8.4 Conditions and Timing for Severance Benefits. The severance benefits set forth in Sections 8.2 and 8.3 above are expressly conditioned upon: (i) Executive's continuing to comply with Executive's obligations under Executive's Proprietary Agreement; and (ii) Executive signing and not revoking a general release of legal claims in the form provided by the Company which shall include a full general release of claims against the Company and related persons and entities and a commitment from Executive to comply with Executive's continuing obligations under Executive's Proprietary Agreement, but will not include a release of any rights or claims for indemnification Executive may have pursuant to any written indemnification agreement with the Company to which Executive is a party, the Company's bylaws, or applicable law (the "***Release***") within the applicable deadline set forth therein and permitting the Release to become effective in accordance with its terms, which must occur no later than forty-five (45) days following the date of termination (the "***Release Deadline***"). The salary continuation payments described in Section 8.2 will be paid in substantially equal installments on the Company's regular payroll schedule and subject to standard deductions and withholdings over the Severance Period following termination; provided, however, that no payments will be made prior to the effectiveness of the Release. On the effective date of the Release, the Company will pay Executive the salary continuation payments that Executive would have received on or prior to such date in a lump sum under the original schedule but for the delay while waiting for the effectiveness of the release, with the balance of the cash severance being paid as originally scheduled.

8.5 **Definitions**. For purposes of this Agreement:

(i) "***Cause***" means, with respect to Executive, the occurrence of any of the following events: (i) Executive's commission of any felony or any crime involving fraud, dishonesty or moral turpitude under the laws of the United States or any state thereof; (ii) Executive's attempted commission of, or participation in, a fraud or act of dishonesty against the Company; (iii) Executive's intentional, material violation of any contract or agreement between Executive and the Company or of any statutory duty owed to the Company that has not been cured, if curable, within fifteen (15) days after written notice from the Board of such violation; (iv) Executive's unauthorized use or disclosure of the Company's confidential information or trade secrets; or (v) Executive's gross misconduct that has not been cured, if curable, within fifteen (15) days after written notice from the Board requesting that the Executive cure such misconduct.

(ii) ***"Disability"*** means the inability of Executive to engage in substantially gainful Company activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than twelve (12) months, and shall be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

(iii) "***Good Reason***" means Executive's resignation from employment with the Company (or successor to the Company, if applicable) due to any of the following actions taken by the Company (or successor to the Company, if applicable) without Executive's prior written consent thereto: (1) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (unless pursuant to a salary reduction program applicable generally to the Company's similarly situated employees); (2) a material reduction in Executive's authority, duties or responsibilities; (3) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation (excluding regular travel in the ordinary course of business); and (4) a breach of a material provision of this Agreement by the Company. *Notwithstanding the foregoing*, in order to resign for Good Reason, Executive must provide written notice to the Company within thirty (30) days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation and allow the Company at least thirty (30) days from receipt of such written notice to cure such event, and, if such event is not reasonably cured within such period, Executive's resignation from all positions Executive then holds with the Company is effective not later than thirty (30) days after the expiration of the cure period.

8.6 **Section 409A.** It is intended that all of the benefits and other payments payable under this Agreement satisfy, to the greatest extent possible, an exemption from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") and the regulations and other guidance thereunder and any state law of similar effect (collectively ***"Section 409A"***), and this Agreement will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this Agreement (and any definitions hereunder) will be construed in a manner that complies with Section 409A, and any ambiguities herein shall be interpreted accordingly. Specifically, the benefits under this Agreement are intended to satisfy the exemptions from application of Section 409A provided under Treasury Regulations Sections 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9) and each installment of

severance benefits is a separate "payment" for purposes of Treasury Regulations Section 1.409A-2(b)(2)(i). However, if such exemptions are not available and Executive is, upon Separation from Service, a "specified employee" for purposes of Section 409A, then, solely to the extent necessary to avoid adverse personal tax consequences under Section 409A, the timing of the severance benefits payments shall be delayed until the earlier of (i) six (6) months and one day after Executive's Separation from Service, or (ii) Executive's death. Severance benefits shall not commence until Executive has a Separation from Service. If the severance benefits are not covered by one or more exemptions from the application of Section 409A and the Release could become effective in the calendar year following the calendar year in which Executive's Separation from Service occurs, the Release will not be deemed effective, for purposes of payment of severance, any earlier than the Release Deadline. Except to the minimum extent that payments must be delayed because Executive is a "specified employee" or until the effectiveness of the Release, all severance amounts will be paid as soon as practicable in accordance with the Company's normal payroll practices.

8.7 Section 280G. If any payment or benefit Executive will or may receive from the Company or otherwise (a "***Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then such Payment will be equal to the Reduced Amount (defined below). The "***Reduced Amount***" will be either (l) the largest portion of the Payment that would result in no portion of the Payment (after reduction) being subject to the Excise Tax or (2) the entire Payment, whichever amount after taking into account all applicable federal, state and local employment taxes, income taxes, and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes), results in Executive's receipt, on an after-tax basis, of the greatest amount of the Payment. If a reduction in the Payment is to be made so that the Payment equals the Reduced Amount, (x) the Payment will be paid only to the extent permitted under the Reduced Amount alternative, and the Executive will have no rights to any additional payments and/or benefits constituting the Payment, and (y) reduction in payments and/or benefits will occur in the following order: (1) reduction of cash payments; (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits paid to Executive. In the event that acceleration of vesting of equity award compensation is to be reduced, such acceleration of vesting will be cancelled in the reverse order of the date of grant of Executive's equity awards. In no event will the Company or any stockholder be liable to Executive for any amounts not paid as a result of the operation of this Section. The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the change in control will perform the foregoing calculations. If the tax firm so engaged by the Company is serving as accountant or auditor for the acquirer, the Company will appoint a nationally recognized tax firm to make the determinations required hereunder. The Company will bear all expenses with respect to the determinations by such firm required to be made hereunder. If the tax firm determines that no Excise Tax is payable with respect to a Payment, either before or after the application of the Reduced Amount, it will furnish the Company and Executive with documentation that no Excise Tax is reasonably likely to be imposed with respect to such Payment. Any good faith determinations of the tax firm made hereunder will be final, binding and conclusive upon the Company and Executive.

9. Dispute Resolution. To ensure the rapid and economical resolution of disputes that may arise in connection with Executive's employment with the Company, Executive and the Company agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, Executive's employment with the Company, or the termination of Executive's employment from the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Diego, California by JAMS, Inc. ("***JAMS***") or its successors, under JAMS' then applicable rules and procedures for employment disputes (which can be found at https://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to Executive on request); provided that the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. Executive and the Company shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. **Both Executive and the Company acknowledge that by agreeing to this arbitration procedure, they waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding**. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fee. Nothing in this Agreement is intended to prevent either the Company or Executive from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration.

10. General Provisions.

10.1 Notices. Any notices provided must be in writing and will be deemed effective upon the earlier of personal delivery (including personal delivery by fax) or the next day after sending by overnight carrier, to the Company at its primary office location and to Executive at the address as listed on the Company payroll.

10.2 Severability. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced in such jurisdiction to the extent possible in keeping with the intent of the Parties.

10.3 Waiver. Any waiver of any breach of any provisions of this Agreement must be in writing to be effective, and it shall not thereby be deemed to have waived any preceding or succeeding breach of the same or any other provision of this Agreement.

10.4 Complete Agreement. This Agreement, together with the Proprietary Agreement, and the Indemnification Agreement attached hereto as **Exhibit B**, constitutes the entire agreement between Executive and the Company with regard to the subject matter hereof and is the complete, final, and exclusive embodiment of the Company's and Executive's agreement with regard to this subject matter. This Agreement is entered into without reliance on any promise or representation, written or oral, other than those expressly contained herein, and it supersedes

any other such promises, warranties or representations (including, but not limited to, the Prior Agreements). It cannot be modified or amended except in a writing signed by a duly authorized officer of the Company, with the exception of those changes expressly reserved to the Company's discretion in this Agreement.

10.5 Counterparts. This Agreement may be executed in separate counterparts, any one of which need not contain signatures of more than one party, but both of which taken together will constitute one and the same Agreement.

10.6 Headings. The headings of the paragraphs hereof are inserted for convenience only and shall not be deemed to constitute a part hereof nor to affect the meaning thereof.

10.7 Successors and Assigns. This Agreement is intended to bind and inure to the benefit of and be enforceable by Executive and the Company, and their respective successors, assigns, heirs, executors and administrators, except that Executive may not assign any of Executive's duties hereunder and Executive may not assign any of Executive's rights hereunder without the written consent of the Company, which shall not be withheld unreasonably.

10.8 Tax Withholding. All payments and awards contemplated or made pursuant to this Agreement will be subject to withholdings of applicable taxes in compliance with all relevant laws and regulations of all appropriate government authorities. Executive acknowledges and agrees that the Company has neither made any assurances nor any guarantees concerning the tax treatment of any payments or awards contemplated by or made pursuant to this Agreement. Executive has had the opportunity to retain a tax and financial advisor and fully understands the tax and economic consequences of all payments and awards made pursuant to the Agreement.

10.9 Choice of Law. All questions concerning the construction, validity and interpretation of this Agreement will be governed by the laws of the State of California.

[Signature Page Follows]

In Witness Whereof, the parties have executed this Agreement on the date first written above.

TOCAGEN INC.

/s/ Martin J. Duvall
Martin J. Duvall
Chief Executive Officer

Executive

/s/ Douglas J. Jolly, Ph.D.
Douglas J. Jolly, Ph.D.

Exhibit A

Proprietary Agreement

11.

EXHIBIT B

INDEMNIFICATION AGREEMENT

12.

Exhibit 10.18

TOCAGEN INC.
RESTRICTED STOCK UNIT GRANT NOTICE
(2017 EQUITY INCENTIVE PLAN)

Tocagen Inc. (the "***Company***"), pursuant to its 2017 Equity Incentive Plan (the "***Plan***"), hereby awards to Participant a Restricted Stock Unit Award for the number of shares of the Company's Common Stock ("***Restricted Stock Units***") set forth below (the "***Award***"). The Award is subject to all of the terms and conditions as set forth in this notice of grant (this "***Restricted Stock Unit Grant Notice***") and in the Plan and the Restricted Stock Unit Agreement (the "***Award Agreement***"), both of which are attached hereto and incorporated herein in their entirety. Capitalized terms not otherwise defined herein will have the meanings set forth in the Plan or the Award Agreement. In the event of any conflict between the terms in the Award and the Plan, the terms of the Plan will control.

Participant: _____
Date of Grant: _____
Number of Restricted Stock Units: _____

Type of Grant: Restricted Stock Units

Issuance Schedule: Subject to any Capitalization Adjustment, one share of Common Stock will be issued for each Restricted Stock Unit that vests.

Vesting Schedule: One hundred percent (100%) of the Number of Restricted Stock Units will vest upon a determination by the Compensation Committee or a subcommittee otherwise delegated by the Board (the "***Committee***") that the following has been achieved:

1.**[**The Participant has successfully completed all transition duties assigned in connection with Project Telluride, plus one of the following:
   a. The Participant has remained in Continuous Service for a period not less than thirty (30) days after the Date of Grant, or
   b. The Participant is deemed by the Committee to have remained in Continuous Service because he or she continues to provide services with an entity that is associated with the Company assets that are spun off for a period of not less than thirty (30) days after the Date of Grant; or
   c. The Participant's Continuous Service has been terminated by the Company without Cause and the Committee determines that the Participant was in "good standing" on the date of such termination; and**]**[1]
2. The Company has undergone a Change in Control.[2]

Additional Terms/Acknowledgements: Participant acknowledges receipt of, and understands and agrees to, this Restricted Stock Unit Grant Notice, the Award Agreement and the Plan. Participant acknowledges and agrees that this Restricted Stock Unit Grant Notice and the Award Agreement may not be modified, amended or revised except as provided in the Plan. Participant further acknowledges that as of the Date of Grant, this Restricted Stock Unit Grant Notice, the Award Agreement and the Plan set forth the entire understanding between Participant and the Company regarding the acquisition of Common Stock pursuant to the Award and supersede all prior oral and written

[1] **Drafting Note:** For the Director Grants, remove the language in Section 1.

[2] **Drafting Note:** For the Employee Grants, this language assumes that there needs to be continued service (or an exception to continued service), successful completion of transition duties, and a determination that the Company has undergone a Change in Control. In other words, there will be no vesting until there is a Change in Control. **Company please confirm.**

agreements on that subject with the exception, if applicable, of (i) equity awards previously granted and delivered to Participant, (ii) any compensation recovery policy that is adopted by the Company or is otherwise required by applicable law, and (iii) any written employment or severance arrangement that would provide for vesting acceleration of this Award upon the terms and conditions set forth therein.

By accepting this Award, Participant consents to receive such documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company.

TOCAGEN INC.	**PARTICIPANT**
By: Signature	Signature
Title:	Date:
Date:	

ATTACHMENTS: Award Agreement, 2017 Equity Incentive Plan

TOCAGEN INC.
2017 EQUITY INCENTIVE PLAN
RESTRICTED STOCK UNIT AGREEMENT

Pursuant to the Restricted Stock Unit Grant Notice (the "***Grant Notice***") and this Restricted Stock Unit Agreement (the "***Award Agreement***") and in consideration of your services, Tocagen Inc. (the "***Company***") has awarded you ("***Participant***") a Restricted Stock Unit Award (the "***Award***") pursuant to Section 6(b) of the Company's 2017 Equity Incentive Plan (the "***Plan***") for the number of Restricted Stock Units/shares indicated in the Grant Notice. Capitalized terms not explicitly defined in this Award Agreement or the Grant Notice will have the same meanings given to them in the Plan. The terms of your Award, in addition to those set forth in the Grant Notice and the Plan, are as follows.

1. GRANT OF THE AWARD. This Award represents the right to be issued on a future date one (1) share of Common Stock for each Restricted Stock Unit that vests on the applicable vesting date(s) (subject to any adjustment under Section 3 below) as indicated in the Grant Notice. As of the Date of Grant, the Company will credit to a bookkeeping account maintained by the Company for your benefit (the "***Account***") the number of Restricted Stock Units/shares of Common Stock subject to the Award. This Award was granted in consideration of your services to the Company. Except as otherwise provided herein, you will not be required to make any payment to the Company or an Affiliate (other than services to the Company or an Affiliate) with respect to your receipt of the Award, the vesting of the Stock Units or the delivery of the Company's Common Stock to be issued in respect of the Award. Notwithstanding the foregoing, the Company reserves the right to issue you the cash equivalent of Common Stock, in part or in full satisfaction of the delivery of Common Stock upon vesting of your Stock Units, and, to the extent applicable, references in this Award Agreement and the Grant Notice to Common Stock issuable in connection with your Stock Units will include the potential issuance of its cash equivalent pursuant to such right.

2. VESTING. Subject to the limitations contained herein, your Award will vest, if at all, in accordance with the vesting schedule provided in the Grant Notice, provided that vesting will cease upon the termination of your Continuous Service. Upon such termination of your Continuous Service, the Restricted Stock Units/shares of Common Stock credited to the Account that were not vested on the date of such termination will be forfeited at no cost to the Company and you will have no further right, title or interest in or to such underlying shares of Common Stock.

3. NUMBER OF SHARES. The number of Restricted Stock Units/shares subject to your Award may be adjusted from time to time for Capitalization Adjustments, as provided in the Plan. Any additional Restricted Stock Units, shares, cash or other property that becomes subject to the Award pursuant to this Section 3, if any, will be subject, in a manner determined by the Board, to the same forfeiture restrictions, restrictions on transferability, and time and manner of delivery as applicable to the other Restricted Stock Units and shares covered by your Award. Notwithstanding the provisions of this Section 3, no fractional shares or rights for fractional shares of Common Stock will be created pursuant to this Section 3. Any fraction of a share will be rounded down to the nearest whole share.

4. SECURITIES LAW COMPLIANCE. You may not be issued any Common Stock under your Award unless the shares of Common Stock underlying the Restricted Stock Units are either (i) then registered under the Securities Act, or (ii) the Company has determined that such issuance would be exempt from the registration requirements of the Securities Act. Your Award must also comply with other applicable laws and regulations governing the Award, and you will not receive such Common Stock if the Company determines that such receipt would not be in material compliance with such laws and regulations.

5. **Transfer Restrictions**. Prior to the time that shares of Common Stock have been delivered to you, you may not transfer, pledge, sell or otherwise dispose of this Award or the shares issuable in respect of your Award, except as expressly provided in this Section 5. For example, you may not use shares that may be issued in respect of your Restricted Stock Units as security for a loan. The restrictions on transfer set forth herein will lapse upon delivery to you of shares in respect of your vested Restricted Stock Units. Notwithstanding the foregoing, by delivering written notice to the Company, in a form satisfactory to the Company, you may designate a third party who, in the event of your death, will thereafter be entitled to receive any distribution of Common Stock to which you were entitled at the time of your death pursuant to this Award Agreement. In the absence of such a designation, your legal representative will be entitled to receive, on behalf of your estate, such Common Stock or other consideration.

(a) **Death**. Your Award is transferable by will and by the laws of descent and distribution. At your death, vesting of your Award will cease and your executor or administrator of your estate will be entitled to receive, on behalf of your estate, any Common Stock or other consideration that vested but was not issued before your death.

(b) **Domestic Relations Orders**. Upon receiving written permission from the Board or its duly authorized designee, and provided that you and the designated transferee enter into transfer and other agreements required by the Company, you may transfer your right to receive the distribution of Common Stock or other consideration hereunder, pursuant to a domestic relations order, official marital settlement agreement or other divorce or separation instrument that contains the information required by the Company to effectuate the transfer. You are encouraged to discuss the proposed terms of any division of this Award with the Company General Counsel prior to finalizing the domestic relations order or marital settlement agreement to verify that you may make such transfer, and if so, to help ensure the required information is contained within the domestic relations order or marital settlement agreement.

6. **Date of Issuance.**

(a) The issuance of shares in respect of the Restricted Stock Units is intended to comply with Treasury Regulations Section 1.409A-1(b)(4) and will be construed and administered in such a manner. Subject to the satisfaction of the withholding obligations set forth in this Award Agreement, in the event one or more Restricted Stock Units vests, the Company will issue to you one (1) share of Common Stock for each Restricted Stock Unit that vests on the applicable vesting date(s) (subject to any adjustment under Section 3 above, and subject to any different provisions in the Grant Notice). The issuance date determined by this paragraph is referred to as the "***Original Issuance Date***".

(b) If the Original Issuance Date falls on a date that is not a business day, delivery will instead occur on the next following business day. In addition, if:

(i) the Original Issuance Date does not occur (1) during an "open window period" applicable to you, as determined by the Company in accordance with the Company's then-effective policy on trading in Company securities, or (2) on a date when you are otherwise permitted to sell shares of Common Stock on an established stock exchange or stock market (including but not limited to under a previously established written trading plan that meets the requirements of Rule 10b5-1 under the Exchange Act and was entered into in compliance with the Company's policies (a "***10b5-1 Plan***")), *and*

(ii) either (1) Withholding Taxes do not apply, or (2) the Company decides, prior to the Original Issuance Date, (A) not to satisfy the Withholding Taxes by withholding shares of Common Stock from the shares otherwise due, on the Original Issuance Date, to you under this Award,

and (B) not to permit you to enter into a "same day sale" commitment with a broker-dealer pursuant to Section 11 of this Agreement (including but not limited to a commitment under a 10b5-1 Plan) and (C) not to permit you to pay the Withholding Taxes in cash or from other compensation otherwise payable to you by the Company,

then the shares that would otherwise be issued to you on the Original Issuance Date will not be delivered on such Original Issuance Date and will instead be delivered on the first business day when you are not prohibited from selling shares of the Company's Common Stock in the open public market, but in no event later than December 31 of the calendar year in which the Original Issuance Date occurs (that is, the last day of your taxable year in which the Original Issuance Date occurs), or, if and only if permitted in a manner that complies with Treasury Regulations Section 1.409A-1(b)(4), no later than the date that is the 15th day of the third calendar month of the applicable year following the year in which the shares of Common Stock under this Award are no longer subject to a "substantial risk of forfeiture" within the meaning of Treasury Regulations Section 1.409A-1(d).

(c) The form of delivery of the shares of Common Stock in respect of your Award (e.g., a stock certificate or electronic entry evidencing such shares) will be determined by the Company.

7. **Dividends**. You will receive no benefit or adjustment to your Award with respect to any cash dividend, stock dividend or other distribution that does not result from a Capitalization Adjustment; provided, however, that this sentence will not apply with respect to any shares of Common Stock that are delivered to you in connection with your Award after such shares have been delivered to you.

8. **Restrictive Legends**. The shares of Common Stock issued under your Award will be endorsed with appropriate legends as determined by the Company.

9. **Execution of Documents**. You hereby acknowledge and agree that the manner selected by the Company by which you indicate your consent to your Grant Notice is also deemed to be your execution of your Grant Notice and of this Award Agreement. You further agree that such manner of indicating consent may be relied upon as your signature for establishing your execution of any documents to be executed in the future in connection with your Award.

10. **Award not a Service Contract.**

(a) Your Continuous Service with the Company or an Affiliate is not for any specified term and may be terminated by you or by the Company or an Affiliate at any time, for any reason, with or without cause and with or without notice. Nothing in this Award Agreement (including, but not limited to, the vesting of your Award or the issuance of the shares subject to your Award), the Plan or any covenant of good faith and fair dealing that may be found implicit in this Award Agreement or the Plan will: (i) confer upon you any right to continue in the employ of, or affiliation with, the Company or an Affiliate; (ii) constitute any promise or commitment by the Company or an Affiliate regarding the fact or nature of future positions, future work assignments, future compensation or any other term or condition of employment or affiliation; (iii) confer any right or benefit under this Award Agreement or the Plan unless such right or benefit has specifically accrued under the terms of this Award Agreement or Plan; or (iv) deprive the Company of the right to terminate you at will and without regard to any future vesting opportunity that you may have.

(b) By accepting this Award, you acknowledge and agree that the right to continue vesting in the Award is earned only by continuing as an employee, director or consultant at the will of the Company or an Affiliate and that the Company has the right to reorganize, sell, spin-out or otherwise restructure one or more of its businesses or Affiliates at any time or from time to time, as it deems appropriate (a "***reorganization***"). You further acknowledge and agree that such a reorganization could result in the termination of your Continuous Service, or the termination of Affiliate status of your employer and the loss of benefits available to you under this Award Agreement, including but not limited to, the termination of the right to continue vesting in the Award. You further acknowledge and agree

that this Award Agreement, the Plan, the transactions contemplated hereunder and the vesting schedule set forth herein or any covenant of good faith and fair dealing that may be found implicit in any of them do not constitute an express or implied promise of continued engagement as an employee or consultant for the term of this Award Agreement, for any period, or at all, and will not interfere in any way with your right or the right of the Company or an Affiliate to terminate your Continuous Service at any time, with or without cause and with or without notice, and will not interfere in any way with the Company's right to conduct a reorganization.

11. WITHHOLDING OBLIGATIONS.

(a) On each vesting date, and on or before the time you receive a distribution of the shares underlying your Restricted Stock Units, and at any other time as reasonably requested by the Company in accordance with applicable tax laws, you hereby authorize any required withholding from the Common Stock issuable to you and otherwise agree to make adequate provision in cash for any sums required to satisfy the federal, state, local and foreign tax withholding obligations of the Company or any Affiliate that arise in connection with your Award (the "***Withholding Taxes***"). Additionally, the Company or any Affiliate may, in its sole discretion, satisfy all or any portion of the Withholding Taxes obligation relating to your Award by any of the following means or by a combination of such means: (i) withholding from any compensation otherwise payable to you by the Company or an Affiliate; (ii) causing you to tender a cash payment; (iii) permitting or requiring you to enter into a "same day sale" commitment, if applicable, with a broker-dealer that is a member of the Financial Industry Regulatory Authority (a "***FINRA Dealer***") (pursuant to this authorization and without further consent) whereby you irrevocably elect to sell a portion of the shares to be delivered in connection with your Restricted Stock Units to satisfy the Withholding Taxes and whereby the FINRA Dealer irrevocably commits to forward the proceeds necessary to satisfy the Withholding Taxes directly to the Company and its Affiliates; or (iv) withholding shares of Common Stock from the shares of Common Stock issued or otherwise issuable to you in connection with the Award with a Fair Market Value (measured as of the date shares of Common Stock are issued to you pursuant to Section 6) equal to the amount of such Withholding Taxes; *provided*, *however*, that the number of such shares of Common Stock so withheld will not exceed the amount necessary to satisfy the Company's required tax withholding obligations using the minimum statutory withholding rates for federal, state, local and, if applicable, foreign tax purposes, including payroll taxes, that are applicable to supplemental taxable income; and *provided further*, that to the extent necessary to qualify for an exemption from application of Section 16(b) of the Exchange Act, if applicable, such share withholding procedure will be subject to the express prior approval of the Company's Compensation Committee. However, the Company does not guarantee that you will be able to satisfy the Withholding Taxes through any of the methods described in the preceding provisions and in all circumstances you remain responsible for timely and fully satisfying the Withholding Taxes.

(b) Unless the tax withholding obligations of the Company and any Affiliate are satisfied, the Company will have no obligation to deliver to you any Common Stock or other consideration pursuant to this Award.

(c) In the event the Company's obligation to withhold arises prior to the delivery to you of Common Stock or it is determined after the delivery of Common Stock to you that the amount of the Company's withholding obligation was greater than the amount withheld by the Company, you agree to indemnify and hold the Company harmless from any failure by the Company to withhold the proper amount.

12. TAX CONSEQUENCES. The Company has no duty or obligation to minimize the tax consequences to you of this Award and will not be liable to you for any adverse tax consequences to you arising in connection with this Award. You are hereby advised to consult with your own personal tax, financial and legal advisors regarding the tax consequences of this Award and by signing the Grant Notice, you have agreed that you have done so or knowingly and voluntarily declined to do so. You understand that you (and not the Company) will be responsible for your own tax liability that may arise as a result of this investment or the transactions contemplated by this Award Agreement.

13. **Unsecured Obligation**. Your Award is unfunded, and as a holder of a vested Award, you will be considered an unsecured creditor of the Company with respect to the Company's obligation, if any, to issue shares or other property pursuant to this Award Agreement. You will not have voting or any other rights as a stockholder of the Company with respect to the shares to be issued pursuant to this Award Agreement until such shares are issued to you pursuant to Section 6 of this Award Agreement. Upon such issuance, you will obtain full voting and other rights as a stockholder of the Company. Nothing contained in this Award Agreement, and no action taken pursuant to its provisions, will create or be construed to create a trust of any kind or a fiduciary relationship between you and the Company or any other person.

14. **Notices**. Any notice or request required or permitted hereunder will be given in writing to each of the other parties hereto and will be deemed effectively given on the earlier of (i) the date of personal delivery, including delivery by express courier, or delivery via electronic means, or (ii) the date that is five (5) days after deposit in the United States Post Office (whether or not actually received by the addressee), by registered or certified mail with postage and fees prepaid, addressed to the Company at its primary executive offices, attention: Stock Plan Administrator, and addressed to you at your address as on file with the Company at the time notice is given.

15. **Headings**. The headings of the Sections in this Award Agreement are inserted for convenience only and will not be deemed to constitute a part of this Award Agreement or to affect the meaning of this Award Agreement.

16. **Additional Acknowledgements**. You hereby consent and acknowledge that:

(a) Participation in the Plan is voluntary and therefore you must accept the terms and conditions of the Plan and this Award Agreement and Grant Notice as a condition to participating in the Plan and receipt of this Award. This Award and any other awards under the Plan are voluntary and occasional and do not create any contractual or other right to receive future awards or other benefits in lieu of future awards, even if similar awards have been granted repeatedly in the past. All determinations with respect to any such future awards, including, but not limited to, the time or times when such awards are made, the size of such awards and performance and other conditions applied to the awards, will be at the sole discretion of the Company.

(b) The future value of your Award is unknown and cannot be predicted with certainty. You do not have, and will not assert, any claim or entitlement to compensation, indemnity or damages arising from the termination of this Award or diminution in value of this Award and you irrevocably release the Company, its Affiliates and, if applicable, your employer, if different from the Company, from any such claim that may arise.

(c) The rights and obligations of the Company under your Award will be transferable by the Company to any one or more persons or entities, and all covenants and agreements hereunder will inure to the benefit of, and be enforceable by, the Company's successors and assigns.

(d) You agree upon request to execute any further documents or instruments necessary or desirable in the sole determination of the Company to carry out the purposes or intent of your Award.

(e) You acknowledge and agree that you have reviewed your Award in its entirety, have had an opportunity to obtain the advice of counsel prior to executing and accepting your Award and fully understand all provisions of your Award.

(f) This Award Agreement will be subject to all applicable laws, rules, and regulations, and to such approvals by any governmental agencies or national securities exchanges as may be required.

(g) All obligations of the Company under the Plan and this Award Agreement will be binding on any successor to the Company, whether the existence of such successor is the result of a direct or indirect purchase, merger, consolidation, or otherwise, of all or substantially all of the business and assets of the Company.

17. **Governing Plan Document**. Your Award is subject to all the provisions of the Plan, the provisions of which are hereby made a part of your Award, and is further subject to all interpretations, amendments, rules and regulations which may from time to time be promulgated and adopted pursuant to the Plan. Your Award (and any compensation paid or shares issued under your Award) is subject to recoupment in accordance with The Dodd–Frank Wall Street Reform and Consumer Protection Act and any implementing regulations thereunder, any clawback policy adopted by the Company and any compensation recovery policy otherwise required by applicable law. No recovery of compensation under such a clawback policy will be an event giving rise to a right to voluntarily terminate employment upon a resignation for "good reason," or for a "constructive termination" or any similar term under any plan of or agreement with the Company.

18. **Effect on Other Employee Benefit Plans**. The value of the Award subject to this Award Agreement will not be included as compensation, earnings, salaries, or other similar terms used when calculating benefits under any employee benefit plan (other than the Plan) sponsored by the Company or any Affiliate except as such plan otherwise expressly provides. The Company expressly reserves its rights to amend, modify, or terminate any or all of the employee benefit plans of the Company or any Affiliate.

19. **Choice of Law**. The interpretation, performance and enforcement of this Award Agreement will be governed by the law of the State of Delaware without regard to that state's conflicts of laws rules.

20. **Severability**. If all or any part of this Award Agreement or the Plan is declared by any court or governmental authority to be unlawful or invalid, such unlawfulness or invalidity will not invalidate any portion of this Award Agreement or the Plan not declared to be unlawful or invalid. Any Section of this Award Agreement (or part of such a Section) so declared to be unlawful or invalid will, if possible, be construed in a manner which will give effect to the terms of such Section or part of a Section to the fullest extent possible while remaining lawful and valid.

21. **Other Documents**. You hereby acknowledge receipt of and the right to receive a document providing the information required by Rule 428(b)(1) promulgated under the Securities Act, which includes the Plan prospectus. In addition, you acknowledge receipt of the Company's policy permitting certain individuals to sell shares only during certain "***window***" periods and the Company's insider trading policy, in effect from time to time.

22. **Amendment**. This Award Agreement may not be modified, amended or terminated except by an instrument in writing, signed by you and by a duly authorized representative of the Company. Notwithstanding the foregoing, this Award Agreement may be amended solely by the Board by a writing which specifically states that it is amending this Award Agreement, so long as a copy of such amendment is delivered to you, and provided that, except as otherwise expressly provided in the Plan, no such amendment materially adversely affecting your rights hereunder may be made without your written consent. Without limiting the foregoing, the Board reserves the right to change, by written notice to you, the provisions of this Award Agreement in any way it may deem necessary or advisable to carry out the purpose of the Award as a result of any change in applicable laws or regulations or any future law, regulation, ruling, or judicial decision, provided that any such change will be applicable only to rights relating to that portion of the Award which is then subject to restrictions as provided herein.

23. **Compliance with Section 409A of the Code**. This Award is intended to comply with the "short-term deferral" rule set forth in Treasury Regulation Section 1.409A-1(b)(4). Notwithstanding the foregoing, if it is determined that the Award fails to satisfy the requirements of the short-term deferral rule and is otherwise deferred compensation subject to Section 409A, and if you are a "Specified Employee" (within the meaning set forth in Section 409A(a)(2)(B)(i) of the Code) as of the date of your "separation from service" (within the meaning of Treasury Regulation Section 1.409A-1(h) and without regard to any alternative definition thereunder), then the issuance of any shares that would otherwise be made upon the date of the separation from service or within the first six (6) months thereafter will not be made on the originally scheduled date(s) and will instead be issued in a lump sum on the earlier of: (i) the fifth business day following your death, or (ii) the date that is six (6) months and one

day after the date of the separation from service, with the balance of the shares issued thereafter in accordance with the original vesting and issuance schedule set forth above, but if and only if such delay in the issuance of the shares is necessary to avoid the imposition of adverse taxation on you in respect of the shares under Section 409A of the Code. Each installment of shares that vests is intended to constitute a "separate payment" for purposes of Treasury Regulation Section 1.409A-2(b)(2).

* * * * *

This Award Agreement will be deemed to be signed by the Company and the Participant upon the signing or electronic acceptance by the Participant of the Restricted Stock Unit Grant Notice to which it is attached.

Exhibit 10.20

FIRST AMENDMENT TO LEASE

THIS FIRST AMENDMENT TO LEASE (this "**First Amendment**") is made as of December 16, 2019, by and between **ARE-SD REGION NO. 61, LLC**, a Delaware limited liability company ("**Landlord**"), and **TOCAGEN, INC.**, a Delaware corporation ("**Tenant**").

RECITALS

A. Landlord and Tenant are now parties to that certain Lease dated as of December 21, 2017 (the "**Lease**"). Pursuant to the Lease, Tenant leases certain premises consisting of approximately 38,849 rentable square feet ("**Premises**") in a building located at 4242 Camus Point Court, San Diego, California (the "**Building**"). The Premises are more particularly described in the Lease. Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. The Lease is scheduled to expire on June 30, 2026.

C. Landlord and Tenant desire, subject to the terms and conditions set forth below, to amend the Lease to reflect the acceleration of the termination of the Lease Term with respect to a portion of the Premises consisting of the entire fifth floor of the Building containing approximately 21,180 rentable square feet (the "**Early Termination Premises**") as of December 31, 2019 (the "**Early Termination Date**").

NOW, THEREFORE, in consideration of the foregoing Recitals, which are incorporated herein by this reference, the mutual promises and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant hereby agree as follows:

1. **Vacating of Premises**. The Lease with respect to the Early Termination Premises shall terminate as provided for in the Lease on the Early Termination Date. Tenant shall voluntarily vacate the Early Termination Premises on such date in accordance with all surrender requirements contained in the Lease and in the condition in which Tenant is required to surrender the Premises as of the expiration of the Lease. From and after the Early Termination Date, Tenant shall have no further rights of any kind with respect to the Early Termination Premises. Notwithstanding the foregoing, those provisions of the Lease which, by their terms, survive the termination of the Lease shall survive the surrender of the Early Termination Premises and termination of the Lease with respect to the Early Termination Premises as provided for herein. Nothing herein shall excuse Landlord or Tenant from its obligations under the Lease with respect to the Early Termination Premises prior to the Early Termination Date.

If Tenant vacates the Early Termination Premises prior to the Early Termination Date. Landlord and its agents shall have the right, commencing on the date that Tenant vacates the Early Termination Premises, without any further notice or consent required from Tenant to (i) freely enter and use the Early Termination Premises, and (ii) install furniture, fixtures and equipment for the New Tenant (as defined in Section 10 below), provided that such entry, use and installation of furniture, fixtures and equipment shall be without cost, expense or liability to Tenant.

2. **Definition of Premises**. Commencing on January 1, 2020, the defined term "**Premises**" set forth in Section 6.1 of the Summary of Basic Lease Information is hereby deleted in its entirety and replaced with the following:

"**Premises:** Approximately 17,669 rentable square feet of space located on the sixth (6th) floor of the Building (as defined below), as depicted on **Exhibit A** attached hereto."

As of January 1, 2020, **Exhibit A** of the Lease shall be amended to delete the Early Termination Premises.

3. **Base Rent**. Notwithstanding anything to the contrary contained herein, Tenant shall continue to pay Base Rent for the entire Premises (including the Early Termination Premises) as provided under the Lease through the Early Termination Date. Commencing on January 1, 2020, Tenant shall no longer be required to pay Base Rent with respect to the Early Termination Premises. Commencing on January 1, 2020, the amounts set forth for "Annual Base Rent" and "Monthly Installment of Base Rent" set forth in the table of Base Rent set forth in Section 8 of the Summary of Basic Lease Information are hereby amended accordingly based on the remaining rentable square footage of the Premises as of January 1, 2020.

4. **Tenant's Share**. Commencing on January 1, 2020, Section 9 of the Summary of Basic Lease Information is hereby deleted and replaced with the following:

"9. Tenant's Share of Operating Expenses, Tax Expenses and Utilities Costs (Section 4.2.6):	13.30% (17,669 rentable square feet within the Premises/132,873 rentable square feet within the Building.)"

5. **Letter of Credit**. Section 20.3.2 of the Lease is hereby deleted in its entirety and is null and void and of no further force or effect and Tenant shall have no right during the Term to reduce the amount of the L-C. For the avoidance of doubt, the amount of the L-C shall remain $585,707.22 following the Early Termination Date.

6. **Parking**. Commencing on January 1, 2020, Section 12 of the Summary of Basic Lease Information is hereby deleted and replaced with the following:

"12. Parking Pass Ratio (Article 23):	A total of fifty-three (53) unreserved parking passes (three (3) unreserved parking spaces for every 1,000 rentable square feet of the Premises)."

7. **Extension Option**. Rider 1 attached to the Lease is hereby deleted in its entirety and is null and void and of no further force or effect and Tenant shall have no further right to extend the Lease beyond June 30, 2026.

8. **FF&E**. Notwithstanding anything to the contrary contained in the Lease, all furniture, fixtures and equipment located within the Early Termination Premises as of the date of this First Amendment shall be deemed the property of Landlord and shall remain in the Early Termination Premises following the Early Termination Date, and Tenant shall have no right to remove any such furniture, fixtures or equipment from the Early Termination Premises.

9. **Holdover**. For the avoidance of doubt, if Tenant fails to vacate the Early Termination Premises on or before the Early Termination Date, such failure to vacate shall constitute a holdover under Article 16 of the Lease and, notwithstanding anything to the contrary contained in the Lease, if Tenant does not vacate the Early Termination Premises on or before January 10, 2020, in addition to any other liabilities to Landlord accruing therefrom, Tenant shall protect, defend, indemnify and hold Landlord harmless from all loss, costs (including reasonable attorneys' fees) and liability resulting from such failure, including, without limiting the generality of the foregoing, any claims made by any succeeding tenant founded upon such failure to surrender, and any lost profits to (or consequential damages suffered by) Landlord resulting therefrom.

10. **Brokers**. Landlord and Tenant each represents and warrants that it has not dealt with any broker, agent or other person (collectively, "**Broker**"), in connection with the transaction reflected in this First Amendment. Landlord and Tenant each hereby agrees to indemnify and hold the other harmless from and against any claims by any Broker claiming a commission or other form of compensation by virtue of having dealt with Tenant or Landlord, as applicable, with regard to this leasing transaction.

11. **Condition Precedent**. Notwithstanding anything to the contrary contained in this First Amendment, Tenant and Landlord acknowledge and agree that the effectiveness of this First Amendment shall be subject to the following condition precedent ("**Condition Precedent**") having been satisfied: Landlord shall have entered into a lease agreement with a third party ("**New Tenant**"), pursuant to which New Tenant agrees to lease the Early Termination Premises, which lease agreement shall be on terms and conditions acceptable to Landlord, in Landlord's sole and absolute discretion. In the event that the Condition Precedent is not satisfied, Landlord shall have the right to terminate this First Amendment upon delivery of written notice to Tenant. Landlord shall have no liability whatsoever to Tenant relating to or arising from Landlord's inability or failure to cause the Condition Precedent to be satisfied.

12. **California Accessibility Disclosure**. For purposes of Section 1938(a) of the California Civil Code, Landlord hereby discloses to Tenant, and Tenant hereby acknowledges, that the Project has not undergone inspection by a Certified Access Specialist (CASp). In addition, the following notice is hereby provided pursuant to Section 1938(e) of the California Civil Code: "A Certified Access Specialist (CASp) can inspect the subject premises and determine whether the subject premises comply with all of the applicable construction-related accessibility standards under state law. Although state law does not require a CASp inspection of the subject premises, the commercial property owner or lessor may not prohibit the lessee or tenant from obtaining a CASp inspection of the subject premises for the occupancy or potential occupancy of the lessee or tenant, if requested by the lessee or tenant. The parties shall mutually agree on the arrangements for the time and manner of the CASp inspection, the payment of the fee for the CASp inspection, and the cost of making any repairs necessary to correct violations of construction-related accessibility standards within the premises." In furtherance of and in connection with such notice: (i) Tenant, having read such notice and understanding Tenant's right to request and obtain a CASp inspection, hereby elects not to obtain such CASp inspection and forever waives its rights to obtain a CASp inspection with respect to the Premises, Building and/or Project to the extent permitted by Legal Requirements; and (ii) if the waiver set forth in clause (i) hereinabove is not enforceable pursuant to Legal Requirements, then Landlord and Tenant hereby agree as follows (which constitute the mutual agreement of the parties as to the matters described in the last sentence of the foregoing notice): (A) Tenant shall have the one-time right to request for and obtain a CASp inspection, which request must be made, if at all, in a written notice delivered by Tenant to Landlord; (B) any CASp inspection timely requested by Tenant shall be conducted (1) at a time mutually agreed to by Landlord and Tenant, (2) in a professional manner by a CASp designated by Landlord and without any testing that would damage the Premises, Building or Project in any way, and (3) at Tenant's sole cost and expense, including, without limitation, Tenant's payment of the fee for such CASp inspection, the fee for any reports prepared by the CASp in connection with such CASp inspection (collectively, the "**CASp Reports**") and all other costs and expenses in connection therewith; (C) the CASp Reports shall be delivered by the CASp simultaneously to Landlord and Tenant; (D) Tenant, at its sole cost and expense, shall be responsible for making any improvements, alterations, modifications and/or repairs to or within the Premises to correct violations of construction-related accessibility standards including, without limitation, any violations disclosed by such CASp inspection; and (E) if such CASp inspection identifies any improvements, alterations, modifications and/or repairs necessary to correct violations of construction-related accessibility standards relating to those items of the Building and Project located outside the Premises that are Landlord's obligation to repair as set forth in the Lease, then Landlord shall perform such improvements, alterations, modifications and/or repairs as and to the extent required by Legal Requirements to correct such violations, and Tenant shall reimburse Landlord for the cost of such improvements, alterations, modifications and/or repairs within 10 business days after Tenant's receipt of an invoice therefor from Landlord.

13. **Miscellaneous**.

a. This First Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This First Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This First Amendment is binding upon and shall inure to the benefit of the parties hereto, their respective successors and assigns.

c. This First Amendment may be executed in two (2) or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Counterparts may be delivered via facsimile, electronic mail (including pdf or any electronic signature process complying with the U.S. federal ESIGN Act of 2000) or other transmission method and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes. Electronic signatures shall be deemed original signatures for purposes of this First Amendment and all matters related thereto, with such electronic signatures having the same legal effect as original signatures.

d. Except as amended and/or modified by this First Amendment, the Lease is hereby ratified and confirmed and all other terms of the Lease shall remain in full force and effect, unaltered and unchanged by this First Amendment. In the event of any conflict between the provisions of this First Amendment and the provisions of the Lease, the provisions of this First Amendment shall prevail. Whether or not specifically amended by this First Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this First Amendment.

[Signatures are on the next page]

IN WITNESS WHEREOF, Landlord and Tenant have executed this First Amendment as of the day and year first above written.

TENANT:

TOCAGEN, INC.,
a Delaware corporation

By: /s/Mark Foletta
Its: Executive Vice President and Chief Financial Officer

LANDLORD:

ARE-SD REGION NO. 61, LLC,
a Delaware limited liability company

By: ARE-SD Region No. 58, LLC,
a Delaware limited liability company,
managing member

By: ALEXANDRIA REAL ESTATE EQUITIES, L.P.,
a Delaware limited partnership,
managing member

By: ARE-QRS CORP.,
a Maryland corporation,
general partner

By: /s/ Jackie Clem
Its: Senior Vice President Legal Affairs

Exhibit 10.21

TOCAGEN INC.

AMENDED AND RESTATED EXECUTIVE EMPLOYMENT AGREEMENT

This Amended and Restated Executive Employment Agreement (the "***Agreement***") is made and entered into effective as of February 21, 2020 (the "***Effective Date***"), by and between Fairooz Kabbinavar M.D. ("***Executive***") and Tocagen Inc. (the "***Company***").

This Agreement supersedes and replaces in their entirety all other or prior agreements, whether oral or written, with respect to Executive's employment terms with the Company or its affiliates or predecessors, including without limitation that certain Executive Employment Agreement between Executive and the Company dated February 26, 2019 (the "***Prior Agreements***"). Executive agrees and acknowledges that this Agreement shall not constitute and shall not be deemed for any purpose to be a termination without Cause or a Good Reason resignation right, including for purposes of the Prior Agreements.

Whereas, the Company and Executive desire to enter into this Agreement to define their mutual rights and duties with respect to Executive's compensation and benefits.

Now, Therefore, in consideration of the mutual promises and covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. Employment by the Company.

1.1 Position. Executive shall serve as the Company's Senior Vice President, Clinical Development and shall report to the Company's Chief Executive Officer. During the term of Executive's employment with the Company, Executive will devote Executive's best efforts and substantially all of Executive's business time and attention to the business of the Company, except for approved vacation periods and reasonable periods of illness or other incapacities permitted by the Company's general employment policies.

1.2 Duties and Location. Executive shall perform such duties as are customarily associated with the position of Senior Vice President, Clinical Development and such other duties as are assigned to Executive by the Company's Chief Executive Officer. Executive's primary office location shall be the Company's headquarters located in San Diego, California. Subject to the terms of this Agreement, the Company reserves the right to (a) reasonably require Executive to perform Executive's duties at places other than Executive's primary office location from time to time and to require reasonable business travel, and (b) modify Executive's job title and duties as it deems necessary and appropriate in light of the Company's needs and interests from time to time.

1.3 Policies and Procedures. The employment relationship between the parties shall be governed by the general employment policies and practices of the Company, except that when the terms of this Agreement differ from or are in conflict with the Company's general employment policies or practices, this Agreement shall control.

2. Cash Compensation.

2.1 Base Salary. For services to be rendered hereunder, Executive shall receive a base salary at the rate of $410,000.00 per year (the "***Base Salary***"), less standard payroll deductions and withholdings and payable in accordance with the Company's regular payroll schedule. The Company's Board of Directors (the "***Board***") (or the Compensation Committee thereof) may review Executive's Base Salary for adjustment from time to time.

2.2 Bonus. Executive will be eligible to be considered for a discretionary annual performance bonus of up to 40% of the Base Salary, pro-rated for the first year of employment, based on achievement of individual and/or corporate performance targets, metrics and/or objectives to be determined and approved by the Board or the Compensation Committee thereof, including pursuant to an annual incentive plan or similar plan approved by the Board, if any. Any such bonus would be paid after the close of the fiscal year and after determination by the Board (or the Compensation Committee thereof) of (i) the level of achievement of the applicable individual and corporate performance targets, metrics and/or objectives and (ii) the amount of the annual incentive compensation earned by Executive (if any). No annual incentive compensation is guaranteed and, in addition to the other conditions for earning such compensation, Executive must remain an employee in good standing of the Company on the annual incentive compensation payment date in order to be eligible for any annual incentive compensation. The Board (or the Compensation Committee thereof) may review Executive's annual performance bonus amount for adjustment from time to time.

3. Standard Company Benefits. Executive shall, in accordance with Company policy and the terms and conditions of the applicable Company benefit plan documents, be eligible to participate in the benefit and fringe benefit programs provided by the Company to its executive officers and other employees from time to time. Any such benefits shall be subject to the terms and conditions of the governing benefit plans and policies and may be changed by the Company in its discretion.

4. Other Expenses. The Company will reimburse Executive for reasonable travel, entertainment or other expenses incurred by Executive in furtherance or in connection with the performance of Executive's duties hereunder, in accordance with the Company's expense reimbursement policy as in effect from time to time.

5. Equity Awards. All Company equity awards previously granted to Executive (such awards, the "***Prior Equity Awards***") shall continue in effect from and following the Effective Date in accordance with their existing terms. Executive may be eligible to receive additional grants of Company equity awards in the sole discretion of and subject to the approval of the Board.

6. Proprietary Information Obligations.

6.1 Proprietary Information Agreement. Executive will continue to abide by the Company's standard Confidential Information and Invention Assignment Agreement attached hereto as **Exhibit A** ("***Proprietary Agreement***").

6.2 Third-Party Agreements and Information. Executive represents and warrants that Executive's employment by the Company does not conflict with any prior employment or consulting agreement or other agreement with any third party, and that Executive will perform Executive's duties to the Company without violating any such agreement. Executive represents and warrants that Executive does not possess confidential information arising out of prior employment, consulting, or other third party relationships, that would be used in connection with Executive's employment by the Company, except as expressly authorized by that third party. During Executive's employment by the Company, Executive will use in the performance of Executive's duties only information that is generally known and used by persons with training and experience comparable to Executive's own, common knowledge in the industry, otherwise legally in the public domain, or obtained or developed by the Company or by Executive in the course of Executive's work for the Company.

7. Outside Activities and Non-Competition and No-Solicit.

7.1 Outside Activities. Throughout Executive's employment with the Company, Executive may engage in civic and not-for-profit activities so long as such activities do not interfere with the performance of Executive's duties hereunder or present a conflict of interest with the Company or its affiliates. Subject to the restrictions set forth herein, and only with prior written disclosure to and consent of the Board, Executive may engage in other types of business or public activities. The Board may rescind such consent, if the Board determines, in its sole discretion, that such activities compromise or threaten to compromise the Company's or its affiliates' business interests or conflict with Executive's duties to the Company or its affiliates.

7.2 Non-Competition During Employment. Except as otherwise provided in this Agreement, during Executive's employment by the Company, Executive will not, without the express written consent of the Board, directly or indirectly serve as an officer, director, stockholder, employee, partner, proprietor, investor, joint venturer, associate, representative or consultant of any person or entity engaged in, or planning or preparing to engage in, business activity competitive with any line of business engaged in (or planned to be engaged in) by the Company or its affiliates; provided, however, that Executive may purchase or otherwise acquire up to (but not more than) one percent (1%) of any class of securities of any enterprise (without participating in the activities of such enterprise) if such securities are listed on any national or regional securities exchange. In addition, Executive will be subject to certain restrictions (including restrictions continuing after Executive's employment ends) under the terms of the Proprietary Agreement.

7.3 Non-Solicitation. Executive agrees that during the period of employment with the Company and for twelve (12) months after the date Executive's employment is terminated for any reason, Executive will not, either directly or through others, solicit or encourage or attempt to solicit or encourage any employee, independent contractor, or consultant of the Company to terminate his or her relationship with the Company in order to become an employee, consultant or independent contractor to or for any other person or entity.

8. Termination of Employment; Severance and Change in Control Benefits.

8.1 At-Will Employment. Executive's employment relationship is at-will. Either Executive or the Company may terminate the employment relationship at any time, with or without Cause (as defined below) or advance notice. In the event Executive's employment with the Company is terminated for any reason, Executive will be entitled to all of Executive's earned compensation and benefits or otherwise as required by law through the date of termination. For the avoidance of doubt, Executive shall not be entitled to any additional compensation or benefits hereunder in the event Executive's employment is terminated for Cause, due to Executive's resignation without Good Reason, upon Executive's death or Executive's Disability (as defined below); *provided that* this Section 8.1 does not purport to alter (a) any separate agreement entered into after the Effective Date and pursuant which Executive is expressly entitled to benefits or other compensation on or after the events set forth in this sentence, including, if applicable, the Equity Documents, or (b) any agreements between the Executive and any third party, including insurance policies or the like. If Executive's employment terminates due to an Involuntary Termination (as defined below), Executive will be eligible to receive the additional compensation and benefits described in Sections 8.2 and 8.3, as applicable.

8.2 Termination Without Cause or Resignation for Good Reason Unrelated to Change in Control. If at any time except during the Change in Control Period (as defined below) (i) the Company terminates Executive's employment without Cause (as defined below and other than as a result of Executive's death or Disability), or (ii) Executive resigns for Good Reason (as defined below), and provided in any case such termination constitutes a "separation from service", as defined under Treasury Regulation Section 1.409A-1(h)) (a "***Separation from Service***") (such termination described in (i) or (ii), an "***Involuntary Termination***"), Executive shall be entitled to receive the following severance benefits, subject in all events to Executive's compliance with Section 8.4 below:

(i) Executive shall receive severance pay in the form of continuation of Executive's base salary in effect (ignoring any decrease that forms the basis for Executive's resignation for Good Reason, if applicable) on the effective date of Executive's Involuntary Termination for the first nine (9) months (the "***Severance Period***") after the date of such termination; and

(ii) If Executive is eligible for and timely elects to continue Executive's health insurance coverage under the Company's group health plans under the Consolidated Omnibus Budget Reconciliation Act of 1985 or the state equivalent ("***COBRA***") following Executive's termination date, the Company will pay the COBRA group health insurance premiums for Executive and Executive's eligible dependents until the earliest of (A) the close of the Severance Period, (B) the expiration of Executive's eligibility for the continuation coverage under COBRA, or (C) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment. For purposes of this Section, references to COBRA premiums shall not include any amounts payable by Executive under a Section 125 health care reimbursement plan under the U.S. Internal Revenue Code. Notwithstanding the foregoing, if at any time the Company determines, in its sole discretion, that it cannot pay the COBRA premiums without potentially incurring financial costs or penalties under applicable law (including, without limitation, Section 2716 of the Public Health Service Act), then

regardless of whether Executive elects continued health coverage under COBRA, and in lieu of providing the COBRA premiums, the Company will instead pay Executive on the last day of each remaining month of the Severance Period, a fully taxable cash payment equal to the COBRA premiums for that month, subject to applicable tax withholdings (such amount, the "***Health Care Benefit Payment***"). The Health Care Benefit Payment shall be paid in monthly installments on the same schedule that the COBRA premiums would otherwise have been paid and shall be equal to the amount that the Company would have otherwise paid for COBRA premiums, and shall be paid until the earlier of (i) expiration of the Severance Period or (ii) the date when Executive becomes eligible for substantially equivalent health insurance coverage in connection with new employment or self-employment.

8.3 Termination Without Cause or Resignation for Good Reason During Change in Control Period. In the event of an Involuntary Termination at any time during the time period commencing three (3) months immediately prior to the effective date of a Change in Control (as defined in the Company's 2017 Equity Incentive Plan (the "***Plan***")) and ending on the date that is twelve (12) months after the effective date of a Change in Control (the "***Change in Control Period***"), in addition to the payments and benefits described in Section 8.2, and subject in all events to Executive's compliance with Section 8.4 below, the Executive shall also be entitled to the following severance benefits:

(i) Notwithstanding anything to the contrary set forth in the Plan or any successor equity incentive plan or any award agreement, the vesting of all of Executive's then-outstanding stock awards, including any Prior Equity Awards, that are subject to time-based vesting shall be fully accelerated such that on the effective date of such termination one hundred percent (100%) of the shares subject to time-based vesting in such stock awards granted to Executive prior to the effective date of such termination shall be fully vested and immediately exercisable by Executive. Treatment of any performance-based vesting equity awards will be governed solely by the terms of the agreements under which such awards were granted and will not be eligible to accelerate vesting pursuant to the foregoing provision.

8.4 Conditions and Timing for Severance Benefits. The severance benefits set forth in Sections 8.2 and 8.3 above are expressly conditioned upon: (i) Executive's continuing to comply with Executive's obligations under Executive's Proprietary Agreement; and (ii) Executive signing and not revoking a general release of legal claims in the form provided by the Company which shall include a full general release of claims against the Company and related persons and entities and a commitment from Executive to comply with Executive's continuing obligations under Executive's Proprietary Agreement, but will not include a release of any rights or claims for indemnification Executive may have pursuant to any written indemnification agreement with the Company to which Executive is a party, the Company's bylaws, or applicable law (the "***Release***") within the applicable deadline set forth therein and permitting the Release to become effective in accordance with its terms, which must occur no later than forty-five (45) days following the date of termination (the "***Release Deadline***"). The salary continuation payments described in Section 8.2 will be paid in substantially equal installments on the Company's regular payroll schedule and subject to standard deductions and withholdings over the Severance Period following termination; provided, however, that no payments will be made prior to the effectiveness of the Release. On the effective date of the Release, the Company will pay Executive the salary continuation payments that Executive would have received on or prior to such date in a lump sum

under the original schedule but for the delay while waiting for the effectiveness of the release, with the balance of the cash severance being paid as originally scheduled.

8.5 Definitions. For purposes of this Agreement:

(i) "***Cause***" means, with respect to Executive, the occurrence of any of the following events: (i) Executive's commission of any felony or any crime involving fraud, dishonesty or moral turpitude under the laws of the United States or any state thereof; (ii) Executive's attempted commission of, or participation in, a fraud or act of dishonesty against the Company; (iii) Executive's intentional, material violation of any contract or agreement between Executive and the Company or of any statutory duty owed to the Company that has not been cured, if curable, within fifteen (15) days after written notice from the Board of such violation; (iv) Executive's unauthorized use or disclosure of the Company's confidential information or trade secrets; or (v) Executive's gross misconduct that has not been cured, if curable, within fifteen (15) days after written notice from the Board requesting that the Executive cure such misconduct.

(ii) ***"Disability"*** means the inability of Executive to engage in substantially gainful Company activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than twelve (12) months, and shall be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

(iii) "***Good Reason***" means Executive's resignation from employment with the Company (or successor to the Company, if applicable) due to any of the following actions taken by the Company (or successor to the Company, if applicable) without Executive's prior written consent thereto: (1) a material reduction in Executive's base salary, which the parties agree is a reduction of at least 10% of Executive's base salary (unless pursuant to a salary reduction program applicable generally to the Company's similarly situated employees); (2) a material reduction in Executive's authority, duties or responsibilities; (3) a relocation of Executive's principal place of employment to a place that increases Executive's one-way commute by more than fifty (50) miles as compared to Executive's then-current principal place of employment immediately prior to such relocation (excluding regular travel in the ordinary course of business); and (4) a breach of a material provision of this Agreement by the Company. *Notwithstanding the foregoing*, in order to resign for Good Reason, Executive must provide written notice to the Company within thirty (30) days after the first occurrence of the event giving rise to Good Reason setting forth the basis for Executive's resignation and allow the Company at least thirty (30) days from receipt of such written notice to cure such event, and, if such event is not reasonably cured within such period, Executive's resignation from all positions Executive then holds with the Company is effective not later than thirty (30) days after the expiration of the cure period.

8.6 Section 409A. It is intended that all of the benefits and other payments payable under this Agreement satisfy, to the greatest extent possible, an exemption from the application of Section 409A of the Internal Revenue Code of 1986, as amended (the "***Code***") and the regulations and other guidance thereunder and any state law of similar effect (collectively ***"Section 409A"***), and this Agreement will be construed to the greatest extent possible as consistent with those provisions, and to the extent not so exempt, this Agreement (and any definitions hereunder) will be construed in a manner that complies with Section 409A, and any ambiguities

herein shall be interpreted accordingly. Specifically, the benefits under this Agreement are intended to satisfy the exemptions from application of Section 409A provided under Treasury Regulations Sections 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9) and each installment of severance benefits is a separate "payment" for purposes of Treasury Regulations Section 1.409A-2(b)(2)(i). However, if such exemptions are not available and Executive is, upon Separation from Service, a "specified employee" for purposes of Section 409A, then, solely to the extent necessary to avoid adverse personal tax consequences under Section 409A, the timing of the severance benefits payments shall be delayed until the earlier of (i) six (6) months and one day after Executive's Separation from Service, or (ii) Executive's death. Severance benefits shall not commence until Executive has a Separation from Service. If the severance benefits are not covered by one or more exemptions from the application of Section 409A and the Release could become effective in the calendar year following the calendar year in which Executive's Separation from Service occurs, the Release will not be deemed effective, for purposes of payment of severance, any earlier than the Release Deadline. Except to the minimum extent that payments must be delayed because Executive is a "specified employee" or until the effectiveness of the Release, all severance amounts will be paid as soon as practicable in accordance with the Company's normal payroll practices.

8.7 Section 280G. If any payment or benefit Executive will or may receive from the Company or otherwise (a "***Payment***") would (i) constitute a "parachute payment" within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the "***Excise Tax***"), then such Payment will be equal to the Reduced Amount (defined below). The "***Reduced Amount***" will be either (l) the largest portion of the Payment that would result in no portion of the Payment (after reduction) being subject to the Excise Tax or (2) the entire Payment, whichever amount after taking into account all applicable federal, state and local employment taxes, income taxes, and the Excise Tax (all computed at the highest applicable marginal rate, net of the maximum reduction in federal income taxes which could be obtained from a deduction of such state and local taxes), results in Executive's receipt, on an after-tax basis, of the greatest amount of the Payment. If a reduction in the Payment is to be made so that the Payment equals the Reduced Amount, (x) the Payment will be paid only to the extent permitted under the Reduced Amount alternative, and the Executive will have no rights to any additional payments and/or benefits constituting the Payment, and (y) reduction in payments and/or benefits will occur in the following order: (1) reduction of cash payments; (2) cancellation of accelerated vesting of equity awards other than stock options; (3) cancellation of accelerated vesting of stock options; and (4) reduction of other benefits paid to Executive. In the event that acceleration of vesting of equity award compensation is to be reduced, such acceleration of vesting will be cancelled in the reverse order of the date of grant of Executive's equity awards. In no event will the Company or any stockholder be liable to Executive for any amounts not paid as a result of the operation of this Section. The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the change in control will perform the foregoing calculations. If the tax firm so engaged by the Company is serving as accountant or auditor for the acquirer, the Company will appoint a nationally recognized tax firm to make the determinations required hereunder. The Company will bear all expenses with respect to the determinations by such firm required to be made hereunder. If the tax firm determines that no Excise Tax is payable with respect to a Payment, either before or after the application of the Reduced Amount, it will furnish the Company and Executive with documentation that no Excise Tax is reasonably likely to be imposed with respect to such Payment. Any good faith determinations of the tax firm made hereunder will be final, binding and conclusive upon the Company and Executive.

9. Dispute Resolution. To ensure the rapid and economical resolution of disputes that may arise in connection with Executive's employment with the Company, Executive and the Company agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, Executive's employment with the Company, or the termination of Executive's employment from the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Diego, California by JAMS, Inc. ("***JAMS***") or its successors, under JAMS' then applicable rules and procedures for employment disputes (which can be found at https://www.jamsadr.com/rules-employment-arbitration/, and which will be provided to Executive on request); provided that the arbitrator shall: (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. Executive and the Company shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. **Both Executive and the Company acknowledge that by agreeing to this arbitration procedure, they waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding**. The Company shall pay all filing fees in excess of those which would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fee. Nothing in this Agreement is intended to prevent either the Company or Executive from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration.

10. General Provisions.

10.1 Notices. Any notices provided must be in writing and will be deemed effective upon the earlier of personal delivery (including personal delivery by fax) or the next day after sending by overnight carrier, to the Company at its primary office location and to Executive at the address as listed on the Company payroll.

10.2 Severability. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced in such jurisdiction to the extent possible in keeping with the intent of the Parties.

10.3 Waiver. Any waiver of any breach of any provisions of this Agreement must be in writing to be effective, and it shall not thereby be deemed to have waived any preceding or succeeding breach of the same or any other provision of this Agreement.

10.4 Complete Agreement. This Agreement, together with the Proprietary Agreement, and the Indemnification Agreement attached hereto as **Exhibit B**, constitutes the entire agreement between Executive and the Company with regard to the subject matter hereof and is the complete, final, and exclusive embodiment of the Company's and Executive's agreement with regard to this subject matter. This Agreement is entered into without reliance on any promise or representation, written or oral, other than those expressly contained herein, and it supersedes

any other such promises, warranties or representations (including, but not limited to, the Prior Agreements). It cannot be modified or amended except in a writing signed by a duly authorized officer of the Company, with the exception of those changes expressly reserved to the Company's discretion in this Agreement.

10.5 Counterparts. This Agreement may be executed in separate counterparts, any one of which need not contain signatures of more than one party, but both of which taken together will constitute one and the same Agreement.

10.6 Headings. The headings of the paragraphs hereof are inserted for convenience only and shall not be deemed to constitute a part hereof nor to affect the meaning thereof.

10.7 Successors and Assigns. This Agreement is intended to bind and inure to the benefit of and be enforceable by Executive and the Company, and their respective successors, assigns, heirs, executors and administrators, except that Executive may not assign any of Executive's duties hereunder and Executive may not assign any of Executive's rights hereunder without the written consent of the Company, which shall not be withheld unreasonably.

10.8 Tax Withholding. All payments and awards contemplated or made pursuant to this Agreement will be subject to withholdings of applicable taxes in compliance with all relevant laws and regulations of all appropriate government authorities. Executive acknowledges and agrees that the Company has neither made any assurances nor any guarantees concerning the tax treatment of any payments or awards contemplated by or made pursuant to this Agreement. Executive has had the opportunity to retain a tax and financial advisor and fully understands the tax and economic consequences of all payments and awards made pursuant to the Agreement.

10.9 Choice of Law. All questions concerning the construction, validity and interpretation of this Agreement will be governed by the laws of the State of California.

[Signature Page Follows]

In Witness Whereof, the parties have executed this Agreement on the date first written above.

By: /s/ Martin J. Duvall
Martin J. Duvall
Chief Executive Officer

Executive

/s/ Fairooz Kabbinavar, M.D.
Fairooz Kabbinavar, M.D.

EXHIBIT A

PROPRIETARY AGREEMENT

EXHIBIT B

INDEMNIFICATION AGREEMENT

12.

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the following Registration Statements:

(1) Registration Statement (Form S-3 No. 333-224880) of Tocagen Inc.,

(2) Registration Statement (Form S-8 No. 333-235852, 333-229963 and 333-223558) pertaining to the 2017 Equity Incentive Plan and the 2017 Employee Stock Purchase Plan of Tocagen Inc., and

(3) Registration Statement (Form S-8 No. 333-217300) pertaining to the 2009 Equity Incentive Plan, 2017 Equity Incentive Plan, and 2017 Employee Stock Purchase Plan of Tocagen Inc.;

of our report dated February 27, 2020, with respect to the financial statements of Tocagen Inc. included in this Annual Report (Form 10-K) of Tocagen Inc. for the year ended December 31, 2019.

/s/ Ernst & Young LLP

San Diego, California
February 27, 2020

Exhibit 31.1

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Martin J. Duvall, certify that:

1. I have reviewed this annual report on Form 10-K 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)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) 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) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) 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

   (d) 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: February 27, 2020

By: /s/ MARTIN J. DUVALL

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

Exhibit 31.2

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Mark Foletta, certify that:

1. I have reviewed this annual report on Form 10-K 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)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) 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) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) 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

   (d) 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(s) 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: February 27, 2020

By: /s/MARK FOLETTA

Mark Foletta
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report of Tocagen Inc. (the "Company") on Form 10-K for the period ending December 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), to which this Certification is attached as Exhibit 32.1, I certify, pursuant to the requirement set forth in Rule 13a-14(b) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Exchange Act; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of the Company.

Date: February 27, 2020 By: /s/ MARTIN J. DUVALL

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

Date: February 27, 2020 By: /s/ MARK FOLETTA

Mark Foletta
Chief Financial Officer
(Principal Financial Officer)

This certification accompanies the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of Tocagen Inc. under the Securities Act of 1933, as amended, or the Exchange Act, as amended (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.