CATABASIS PHARMACEUTICALS INC
Form S-1/A
June 12, 2018

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As Filed with the Securities and Exchange Commission on June 12, 2018

Registration No. 333-225410

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Amendment No. 1
to

FORM S-1

REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

CATABASIS PHARMACEUTICALS, INC.

(Exact name of registrant as specified in its charter)

Delaware	**2834**	**26-3687168**
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification No.)

One Kendall Square
Bldg. 1400E, Suite B14202
Cambridge, Massachusetts 02139
(617) 349-1971

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Jill C. Milne, Ph.D.
President and Chief Executive Officer
Catabasis Pharmaceuticals, Inc.
One Kendall Square
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Cambridge, Massachusetts 02139
(617) 349-1971

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Approximate date of commencement of proposed sale to the public: As soon as practicable after this Registration Statement is declared effective.

If any of the securities being registered on this form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, check the following box. ý

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

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

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a 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 o	Accelerated filer o	Non-accelerated filer ý (Do not check if a smaller reporting company)	Smaller reporting company o
			Emerging growth company ý

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 7(a)(2)(B) of the Securities Act. ý

CALCULATION OF REGISTRATION FEE

Title of Each Class of Securities to be Registered	**Proposed Maximum Aggregate Offering Price(1)(2)**	**Amount of Registration Fee**
Common Units, each Common Unit consisting of one share of common stock, par value $0.001 per share, and one warrant to purchase one share of common stock	$30,000,000(3)	$3,735
(i) Common stock included in the Common Units(4)		
(ii) Warrants included in the Common Units(4)		
Pre-funded Units, each Pre-funded Unit consisting of one Pre-funded Warrant to purchase one share of common stock, and one Warrant to purchase one share of common stock	(3)	(3)
(i) Pre-funded Warrants included in the Pre-funded Units(4)		
(ii) Warrants included in the Pre-funded Units(4)		
Shares of common stock underlying Pre-funded Warrants included in the Pre-funded Units(4)	(3)	(3)

Shares of common stock underlying Warrants included in the Common Units and the Pre-funded Units(5)	$36,000,000	$4,482
Total	$66,000,000	$8,217(6)

(1) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(o) under the Securities Act of 1933, as amended.

(2) Pursuant to Rule 416(a) under the Securities Act of 1933, as amended, this registration statement shall also cover an indeterminate number of shares that may be issued and resold resulting from stock splits, stock dividends or similar transactions.

(3) The proposed maximum aggregate offering price of the Common Units proposed to be sold in the offering will be reduced on a dollar-for-dollar basis based on the offering price of any Pre-funded Units offered and sold in the offering, and the proposed maximum aggregate offering price of the Pre-funded Units to be sold in the offering will be reduced on a dollar-for-dollar basis based on the offering price of any Common Units sold in the offering. Accordingly, the proposed maximum aggregate offering price of the Common Units and Pre-funded Units (including the common stock issuable upon exercise of the Pre-funded Warrants included in the Pre-funded Units), if any, is $30,000,0000.

(4) Filing fee included with the Common Units or Pre-funded Units, as applicable.

(5) Pursuant to Staff Compliance and Disclosure Interpretation 240.06, equals the aggregate exercise price of the Warrants.

(6) The Registrant previously paid a registration fee of $3,735 in connection with the initial filing of this registration statement. Accordingly, the registrant has paid an additional registration fee of $4,482 in connection with the filing of this Amendment No. 1.

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

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

SUBJECT TO COMPLETION, DATED JUNE 12, 2018
PRELIMINARY PROSPECTUS

Catabasis Pharmaceuticals, Inc.

20,270,270 Common Units, Each Consisting of One Share of Common Stock and a Warrant to Purchase One Share of Common Stock

20,270,270 Pre-funded Units, Each Consisting of a Pre-funded Warrant to Purchase One Share of Common Stock and a Warrant to Purchase One Share of Common Stock

We are offering 20,270,270 common units (each a "Common Unit"), each Common Unit consisting of one share of our common stock and a warrant to purchase one share of our common stock at an exercise price per share of common stock equal to 120% of the public offering price per Common Unit (each a "Warrant"). Each Warrant will be exercisable immediately and will expire five years from the date of issuance.

We are also offering to those purchasers, if any, whose purchase of Common Units in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if the purchaser so chooses, pre-funded units (each a "Pre-funded Unit") in lieu of Common Units that would otherwise result in the purchaser's beneficial ownership exceeding 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock. We are offering a maximum of 20,270,270 Pre-funded Units. Each Pre-funded Unit will consist of a pre-funded warrant to purchase one share of our common stock at an exercise price of $0.01 per share (each a "Pre-funded Warrant") and a Warrant. The purchase price of each Pre-funded Unit is equal to the price per Common Unit being sold to the public in this offering, minus $0.01. The Pre-funded Warrants will be immediately exercisable and may be exercised at any time until all of the Pre-funded Warrants are exercised in full.

We are also offering the shares of common stock that are issuable from time to time upon exercise of the Warrants and Pre-funded Warrants being offered by this prospectus.

For each Pre-funded Unit we sell, the number of Common Units we are offering will be decreased on a one-for-one basis. Common Units and Pre-funded Units will not be issued or certificated. The shares of common stock or Pre-funded Warrants, as the case may be, and the Warrants included in the Common Units or the Pre-funded Units, can only be purchased together in this offering, but the securities contained in the Common Units or Pre-funded Units will be issued separately and will be immediately separable upon issuance.

There is no established public trading market for the Warrants or the Pre-funded Warrants, and we do not expect a market to develop. We do not intend to apply for listing of the Warrants or the Pre-funded Warrants on any securities exchange or other nationally recognized trading system. Without an active trading market, the liquidity of the Warrants or the Pre-funded Warrants will be limited.

Our common stock is listed on the Nasdaq Global Market under the symbol "CATB." On June 8, 2018, the last reported sale price of our common stock on the Nasdaq Global Market was $1.48 per share. The public offering price per Common Unit or Pre-funded Unit, as the case may be, will be determined between us, the underwriters and investors based on market conditions at the time of pricing, and may be at a discount to the current market price of our common stock. Therefore, the recent market price used throughout this prospectus may not be indicative of the final offering price.

We are an "emerging growth company" under applicable Securities and Exchange Commission rules and are subject to reduced public company disclosure requirements. See "Summary Implications of Being an Emerging Growth Company."

You should read this prospectus, together with additional information described under the headings "Incorporation of Certain Documents by Reference" and "Where You Can Find More Information," carefully before you invest in any of our securities.

Investing in our securities involves risks. See "Risk Factors" beginning on page 12 of this prospectus and in our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, which is incorporated herein by reference.

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

	Per Common Unit	Per Pre-funded Unit	Total
Price to the public	$	$	$
Underwriting discount and commissions(1)	$	$	$
Proceeds to us (before expenses)	$	$	$

(1) We refer you to "Underwriting" beginning on page 41 for additional information regarding the compensation payable to the underwriters.

Delivery of the securities offered hereby is expected to be made on or about , 2018.

Oppenheimer & Co.

Prospectus dated , 2018

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ABOUT THIS PROSPECTUS

We have not, and the underwriters have not, authorized anyone to provide you with information that is different from that contained in this prospectus or in any free writing prospectus we may authorize to be delivered or made available to you. When you make a decision about whether to invest in our securities, you should not rely upon any information other than the information contained in or incorporated by reference in this prospectus or in any free writing prospectus that we may authorize to be delivered or made available to you. Neither the delivery of this prospectus nor the sale of our securities means that the information contained in this prospectus or any free writing prospectus is correct after the date of this prospectus or such free writing prospectus. This prospectus is not an offer to sell or the solicitation of an offer to buy our securities in any circumstances under which the offer or solicitation is unlawful.

For investors outside the United States: we have not, and the underwriters have not, taken any action that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than in the United States. Persons outside the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the securities covered hereby and the distribution of this prospectus outside the United States.

Unless otherwise indicated, information contained in this prospectus concerning our industry and the markets in which we operate, including our general expectations and market position, market opportunity and market share, is based on information from our own management estimates and research, as well as from industry and general publications and research, surveys and studies conducted by third parties. Management estimates are derived from publicly available information, our knowledge of our industry and assumptions based on such information and knowledge, which we believe to be reasonable. Our management estimates have not been verified by any independent source, and we have not independently verified any third-party information. In addition, assumptions and estimates of our and our industry's future performance are necessarily subject to a high degree of uncertainty and risk due to a variety of factors, including those described in "Risk Factors" beginning on page 12 of this prospectus and included under the section entitled "Risk Factors" in our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, which is incorporated by reference herein. These and other factors could cause our future performance to differ materially from our assumptions and estimates. See "Cautionary Note Regarding Forward-Looking Statements."

We further note that the representations, warranties and covenants made by us in any agreement that is filed as an exhibit to the registration statement of which this prospectus is a part were made solely for the benefit of the parties to such agreement, including, in some cases, for the purpose of allocating risk among the parties to such agreements, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were accurate only as of the date when made. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs.

We have proprietary rights to trademarks used in this prospectus, including MoveDMD®. Solely for our convenience, trademarks and trade names referred to in this prospectus may appear without the "®" or " " symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent possible under applicable law, our rights or the rights to these trademarks and trade names. We do not intend our use or display of other companies' trade names, trademarks or service marks to imply a relationship with, or endorsement or sponsorship of us by, any other companies. Each trademark, trade name, or service mark of any other company appearing in this prospectus is the property of its respective holder.

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PROSPECTUS SUMMARY

This summary highlights information contained in other parts of this prospectus or incorporated by reference into this prospectus from our Annual Report on Form 10-K for the year ended December 31, 2017, our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, our definitive proxy statement on Schedule 14A filed with the Securities and Exchange Commission, or the SEC, on April 26, 2018 and our other filings with the SEC listed in the section of the prospectus entitled "Incorporation of Certain Documents by Reference." Because it is only a summary, it does not contain all of the information that you should consider before investing in our securities and it is qualified in its entirety by, and should be read in conjunction with, the more detailed information appearing elsewhere or incorporated by reference in this prospectus. You should read the entire prospectus, the registration statement of which this prospectus is a part, and the information incorporated by reference herein in their entirety before investing in our securities, including the "Risk Factors" section beginning on page 12 of this prospectus and the information in our Annual Report on Form 10-K for the year ended December 31, 2017 and our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, which include our financial statements and the related notes. Except as otherwise indicated herein or as the context otherwise requires, references in this prospectus to "Catabasis," "the company," "we," "us" and "our" refer to Catabasis Pharmaceuticals, Inc. and its consolidated subsidiary.

Overview

We are a clinical-stage biopharmaceutical company focused on the discovery, development and commercialization of novel therapeutics based on our proprietary Safely Metabolized And Rationally Targeted linker, or SMART Linker[SM], drug discovery platform. Our SMART Linker drug discovery platform enables us to engineer product candidates that can simultaneously modulate multiple targets in a disease. Our proprietary product candidates impact pathways that are central to diseases where efficacy may be optimized by a multiple target approach. We have applied our SMART Linker drug discovery platform to build an internal pipeline of product candidates for rare diseases, including our primary focus, edasalonexent, in development for the treatment of Duchenne muscular dystrophy, or DMD.

Our lead product candidate is edasalonexent, formerly known as CAT-1004, which we believe has the potential to be a disease-modifying therapy for all patients affected by DMD, regardless of the underlying dystrophin mutation. Edasalonexent is an oral small molecule that inhibits NF-κB, or nuclear factor kappa-light-chain-enhancer of activated B cells. DMD is an ultimately fatal genetic disorder involving progressive muscle degeneration. The United States Food and Drug Administration, or FDA, has granted orphan drug, fast track and rare pediatric disease designations to edasalonexent for the treatment of DMD. The European Commission, or EC, has granted orphan medicinal product designation to edasalonexent for the treatment of DMD.

Our MoveDMD® Phase 1/2 trial enrolled ambulatory boys four to seven years old with a genetically confirmed diagnosis of DMD who were steroid naive or had not used steroids for at least six months prior to the trial. Boys enrolled in the trial were not limited to any specific dystrophin mutations and the 31 boys in the trial had 26 different dystrophin mutations. The MoveDMD trial was designed to be conducted in three sequential parts, Phase 1, Phase 2, and an open-label extension, which is on-going. We have completed key efficacy and safety assessments from the MoveDMD trial and have observed substantial slowing of DMD disease progression as supported by functional assessments, magnetic resonance imaging, or MRI, results and biomarker results with edasalonexent treatment.

In the open-label extension of the MoveDMD trial after more than a year of oral 100 mg/kg/day edasalonexent treatment, we observed preserved muscle function and consistent improvements in all

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four assessments of muscle function compared to the rates of change in the control period for boys prior to receiving edasalonexent treatment. Additionally, changes in non-effort based measures of muscle health were seen, supporting the durability of edasalonexent treatment effects. Specifically, we observed statistically significant improvement in the rate of change in lower leg composite magnetic resonance imaging T2 through 12, 24, 36 and 48 weeks on oral 100 mg/kg of edasalonexent treatment compared to the off-treatment control period. The relative proportion of fat in muscle, which is referred to as fat fraction and is correlated with functional ability, can also be determined by magnetic resonance spectroscopy, or MRS. Improvements in the MRS fat fraction rate of change through 48 weeks of edasalonexent treatment compared to the off-treatment control period were observed in both soleus and vastus lateralis leg muscles, which are strongly correlated with ambulatory function. Through more than one year of treatment, edasalonexent continued to be well tolerated with no safety signals observed in the trial. We plan to initiate a global Phase 3 clinical trial for the treatment of DMD to evaluate the efficacy and safety of edasalonexent for registration purposes, dependent on raising capital.

We are also evaluating other diseases where the inhibition of NF-kB may be beneficial for further therapeutic applications of edasalonexent, such as Becker muscular dystrophy, or BMD. Patients with BMD express low levels of dystrophin due to mutations in the dystrophin gene. Dystrophin production is reduced through the NF-kB-mediated induction of microRNAs that inhibit dystrophin translation. Inhibition of NF-kB in BMD directly enhances dystrophin production.

In addition to edasalonexent, we have developed additional product candidates using our SMART Linker drug discovery platform as potential treatments for rare diseases, including CAT-5571, a potential treatment for cystic fibrosis, or CF. CAT-5571 is a small molecule that is designed to activate autophagy, a mechanism for recycling cellular components and digesting pathogens, which is important for host defenses and is depressed in CF. We have completed investigational new drug, or IND, application-enabling activities for CAT-5571.

As of April 30, 2018, we owned six issued U.S. patents with composition of matter and method of use claims directed to edasalonexent and four issued U.S. patents with composition of matter and method of use claims directed to CAT-5571. These patents are expected to expire between 2029 and 2030, without taking into account potential patent term extensions. In addition, our patent portfolio includes over 70 issued foreign patents, seven pending U.S. patent applications and 20 pending foreign patent applications. This patent portfolio does not include a number of patents and patent applications related to the development of certain product candidates other than those directed to edasalonexent and CAT-5571, because we have elected to abandon those patents or patent applications as part of our recent restructuring in April 2018.

For additional information regarding our business, see the sections entitled "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and the related notes thereto included in our Annual Report on Form 10-K for the year ended December 31, 2017 and our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, as well as the section entitled "Business" included in our Annual Report on Form 10-K for the year ended December 31, 2017, each of which is incorporated by reference into this prospectus.

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Our Product Candidates

The following chart summarizes key information regarding our product candidates. We hold rights to all of our product candidates throughout the world.

Edasalonexent

Edasalonexent is a SMART Linker conjugate of salicylic acid and the omega-3 fatty acid docosahexaenoic acid, or DHA, a naturally occurring unsaturated fatty acid with anti-inflammatory properties. We designed edasalonexent to inhibit NF-κB, a protein that is activated in DMD and that drives inflammation, fibrosis and muscle degeneration, and suppresses muscle regeneration. We have reported results from Phase 1, Phase 2 and the open-label extension of the MoveDMD trial through administration of edasalonexent for up to 60 weeks, as described further below under " Edasalonexent Clinical Development." The FDA has granted edasalonexent orphan drug, fast track and rare pediatric disease designations for the treatment of DMD. The EC has granted orphan medicinal product designation to edasalonexent for the treatment of DMD.

Edasalonexent Clinical Development

MoveDMD Phase 1/2 Trial of Edasalonexent in Patients with DMD

Our MoveDMD Phase 1/2 trial enrolled ambulatory boys ages four to seven with a genetically confirmed diagnosis of DMD, regardless of mutation, who were steroid naive or had not used steroids for at least six months prior to the trial. The MoveDMD trial was designed to be conducted in three sequential parts, Phase 1, Phase 2, and an open-label extension, which is on-going. We have completed key efficacy and safety assessments from the MoveDMD trial and have observed substantial slowing of DMD disease progression as supported by functional assessments, MRI results and biomarker results with edasalonexent treatment. Edasalonexent has been well tolerated with no clinical safety signals.

We have evaluated the data collected in the MoveDMD trial against two benchmarks. Our MoveDMD trial design pre-specified an assessment of the rate of change of muscle function and magnetic resonance, or MR, for boys participating in the MoveDMD trial during off-treatment periods prior to the Phase 2 portion of the trial, which averaged more than 6 months. We also compared the

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MoveDMD trial data to an ImagingDMD natural history study in which muscle function and MR were assessed annually. We observed a decline in muscle function in boys in the MoveDMD trial during the off-treatment control period consistent with the ImagingDMD natural history study observations of muscle function for boys not receiving corticosteroids in this age range. We believe the ImagingDMD data provide important corroboration of the MoveDMD off-treatment control period observations of muscle function.

Changes in MRI measures, particularly the relative proportion of fat in muscle, which is referred to as fat fraction, have been correlated in natural history studies with longer-term changes in clinically meaningful measures of functional activity. Histological changes in muscle in DMD include inflammation present from an early age, and, as boys with DMD get older, the amount of fat in their muscles increases with consequent loss of functional abilities. While MRI T2 measures both inflammation and fat, MRI T2 increases over time in DMD largely reflect fat infiltration and are strongly correlated with worse performance on timed function tests and predict future loss of functional abilities. MRS measures fat fraction and is strongly correlated with MRI T2, and is similarly correlated with worse performance on timed function tests and predict future loss of functional abilities. We observed an increase in MRI T2 and an increase in MRS fat fraction in boys in the MoveDMD trial during the off-treatment control period. In addition, in the ImagingDMD natural history study, where more than three quarters of the boys with MR measurements were receiving corticosteroids, the MRI T2 and MRS fat fraction increased year after year.

In April 2018, we reported data showing significantly slowed DMD disease progression as measured by MR through 48 weeks of treatment. We reported statistically significant improvement in the rate of change in lower leg composite MRI T2 through 12, 24, 36 and 48 weeks on oral 100 mg/kg of edasalonexent treatment compared to the off-treatment control period ($p<0.05$ for all time points[2]). The rate of increase in MRS fat fraction in the soleus and vastus lateralis muscles with edasalonexent treatment in the MoveDMD trial were numerically less through 48 weeks compared to the rate of increase in boys prior to treatment. MRI T2 and MRS fat fraction rates of change in boys in the MoveDMD trial were less than those observed in the ImagingDMD natural history study. In recent guidance on DMD development, the FDA stated that it considers MRI measures to be important supportive early endpoints demonstrating therapeutic effect.

Consistent with the edasalonexent MR data, in February 2018, we reported a preservation of muscle function and slowing of DMD disease progression in the Phase 2 MoveDMD trial and open-label extension in boys treated with edasalonexent compared to the rates of change during the control period prior to receiving edasalonexent. Through a year of treatment, the 100 mg/kg/day treatment group showed consistent and clinically meaningful improvements in rates of decline compared to rates of change during the control period across all four assessments of muscle function in the trial: the three timed function tests (10-meter walk/run, 4-stair climb and time to stand), as well as the North Star Ambulatory Assessment, an integrated global assessment of muscle function. In recent guidance on DMD development, the FDA identified these four assessments of muscle function as age-appropriate tests for assessing DMD disease progression in young boys.

Additional supportive measures of muscle health also reinforce the positive edasalonexent treatment effects observed in the 100 mg/kg/day treatment group. All four muscle enzymes tested (creatine kinase, alanine aminotransferase, aspartate aminotransferase and lactate dehydrogenase) were significantly decreased compared to baseline following edasalonexent treatment at 12 weeks and later time points through 60 weeks ($p<0.05$), consistent with the observations that edasalonexent slowed muscle degeneration and improve muscle integrity. Biomarker results showed that C-reactive protein, or CRP,

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[1] P-value is a conventional statistical method for measuring the statistical significance of clinical results. A p-value of 0.05 or less represents statistical significance, meaning that there is a 1-in-20 or less statistical probability that the observed results occurred by chance.

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was significantly decreased with edasalonexent at 12, 24, 36 and 48 weeks compared to baseline in the 100 mg/kg/day treatment group ($p<0.001$). CRP is a well-characterized blood test marker that provides a global assessment of inflammation and is elevated in boys affected by DMD. The significant decrease observed in CRP supports a conclusion that the biological activity of edasalonexent in inhibiting NF-kB can decrease inflammation.

In addition, to provide a preclinical understanding of a potential future clinical dosing regimen, we developed a population pharmacokinetic model using data from multiple clinical trials. We observed in the MoveDMD Phase 1 data that edasalonexent produces dose-related reductions in NF-κB regulated and inflammation-related gene transcripts that are driven by C_{trough}, which is the lowest concentration of drug substance prior to receiving the next dose. In preclinical models, we observed that C_{trough} is a driver of efficacy. Our pharmacokinetic/pharmacodynamic profiles and population pharmacokinetic modeling suggest that dosing frequency to maximize time over a certain threshold drug concentration, rather than maximum concentration or drug total exposure, primarily drives pharmacologic effect.

Edasalonexent has been well tolerated in the MoveDMD trial with no clinical safety signals observed to date. The majority of adverse events, or AEs, have been mild in nature with no serious AEs, no drug discontinuations and no dose reductions. Height, weight and BMI growth patterns were similar to standard growth curves for unaffected boys in the age range of the boys participating in the MoveDMD trial, unlike the adverse treatment effects on these growth patterns with the current standard of care in DMD, corticosteroids. Additionally, boys with DMD in this age range typically have resting tachycardia, a heart rate that exceeds the normal resting rate, and the heart rate of the boys treated with edasalonexent decreased toward age-normative values during treatment through the last measurements taken at 48 weeks.

Planned Phase 3 Clinical Trial

We plan to initiate a single global Phase 3 clinical trial for the treatment of DMD in 2018 with top-line results expected in the second quarter of 2020, assuming the completion of this offering. The purpose of the trial is to evaluate the efficacy and safety of edasalonexent for registration purposes. The design of this randomized, double-blind, placebo-controlled trial has been informed by discussions with the FDA and the European Medicines Agency. We expect that the Phase 3 clinical trial will have many key elements in common with the Phase 2 trial, including the patient population and endpoints. We anticipate enrolling approximately 125 boys, four to seven years old, who have not been on steroids for at least 6 months. We may consider enrolling boys on a stable dose of EXONDYS 51, one of two therapies approved by the FDA for the treatment of DMD, dependent on final trial design.

Overview of DMD

DMD is a rare pediatric disorder involving progressive muscle degeneration that eventually leads to death. DMD is caused by various mutations in the dystrophin gene that result in a lack of functional dystrophin in muscle fibers, which renders muscle fibers more susceptible to mechanical stress. Dystrophin is a protein that resides in the membrane of muscle cells and is critical to the structural and membrane stability of muscle fibers in skeletal, diaphragm, and cardiac muscle. When muscles contract or stretch during normal use, the absence of normally functioning dystrophin results in activation of the NF-κB pathway, triggering inflammation in the muscles, initiating muscle degeneration, and reducing the ability of muscles to regenerate. As muscle damage progresses, connective and adipose tissues replace muscle fibers, resulting in inexorable muscle weakness.

DMD is the most common fatal genetic childhood disease and it occurs almost exclusively in males, occurring in approximately 1 in 3,500 live male births. Based on this incidence rate, we estimate that

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DMD affects a total of approximately 15,000 patients in the United States and approximately 19,000 patients in the European Union.

Children with DMD typically begin to show symptoms of disease between ages two and five, when they develop a waddling gait, frequently fall and have difficulty rising from the floor. Progressive weakness then develops in the muscles in the arms, legs and trunk. This muscle weakness is accompanied by fixations, or contractures, of joints, such as knees, hips and elbows. By age eight, most patients have difficulty ascending stairs. Patients typically lose walking ability between the ages of ten and fourteen and, by about twelve years of age, most people with DMD are unable to walk and need to use a wheelchair on a regular basis. Patients' cardiac and respiratory muscles are also adversely affected, typically requiring use of ventilators in their late teens. Progressive weakening of cardiac and respiratory muscles of DMD patients eventually results in death, generally in the patient's mid-twenties.

CAT-5571

CAT-5571 is a SMART Linker conjugate that contains cysteamine, a naturally occurring molecule that is a degradation product of the amino acid cysteine, and DHA. We have developed CAT-5571 as a potential oral treatment for CF, designed to activate autophagy and thereby restore host defense. Autophagy is a mechanism for recycling cellular components and digesting pathogens, which is depressed in CF. CAT-5571 has been shown to restore autophagy, reestablish host defense and enhance the clearance of pathogens, including *P. aeruginosa* and *B. cenocepacia* in preclinical models of CF. We have completed IND-enabling activities for CAT-5571.

CF is a rare, chronic, genetic, life-shortening orphan disease that affects over 70,000 patients worldwide, predominantly in the Caucasian population. In CF, a malfunctioning cystic fibrosis transmembrane conductance regulator ion channel impairs chloride secretion, with deleterious effects on multiple organs, and particularly devastating effects on pulmonary, intestinal and pancreatic function. Patients affected with CF are also predisposed to respiratory failure caused by persistent lung infections, notably bacteria and most commonly *P. aeruginosa,* that are difficult to treat with standard antibiotics. CF patients have frequent pulmonary exacerbations due to their inability to clear the persistent lung infections. Advancement in research and treatments have extended the life expectancy for those living with CF, however, there is currently no cure.

Our Corporate Information

We were incorporated under the laws of the State of Delaware on June 26, 2008 under the name Catabasis Pharmaceuticals, Inc. Our executive offices are located at One Kendall Square, Bldg. 1400E, Suite B14202, Cambridge, Massachusetts 02139, and our telephone number is (617) 349-1971. Our website address is www.catabasis.com. The information contained on, or that can be accessed through, our website is not a part of this prospectus. We have included our website address in this prospectus solely as an inactive textual reference.

Implications of Being an Emerging Growth Company

We qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act, and we may remain an emerging growth company until the end of our 2020 fiscal year. However, if certain events occur prior to the end of such period, including if we become a "large accelerated filer," our annual gross revenue exceeds $1.07 billion, or we issue more than $1.0 billion of non-convertible debt in any three-year period, we will cease to be an emerging growth company prior to the end of such period. For so long as we remain an emerging growth company, we are permitted and intend to rely on exemptions from certain disclosure and other requirements that are

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applicable to other public companies that are not emerging growth companies. These exemptions include:

- reduced disclosure about our executive compensation arrangements;
- exemption from holding non-binding advisory votes on executive compensation, including golden parachute arrangements; and
- exemption from the auditor attestation requirement in the assessment of our internal controls over financial reporting.

Accordingly, the information contained in this prospectus, and the information incorporated herein by reference, may be different than the information you receive from other public companies in which you hold stock. However, we have irrevocably elected not to avail ourselves of the extended transition period for complying with new or revised accounting standards, and, therefore, we are subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

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THE OFFERING

Common Units offered	We are offering 20,270,270 Common Units in this offering, assuming a public offering price of $1.48 per Common Unit, the last sale price per share of our common stock on June 8, 2018, as reported on the Nasdaq Global Market. Each Common Unit will consist of one share of our common stock and a warrant to purchase one share of our common stock at an exercise price per share equal to 120% of the public offering price per Common Unit (each a "Warrant").
Pre-funded Units offered	We are also offering to those purchasers, if any, whose purchase of Common Units in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if the purchaser so chooses, pre-funded units (each a "Pre-funded Unit") in lieu of Common Units that would otherwise result in the purchaser's beneficial ownership exceeding 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding common stock. Each Pre-funded Unit will consist of a pre-funded warrant to purchase one share of our common stock at an exercise price of $0.01 per share (each a "Pre-funded Warrant") and a Warrant. The purchase price of each Pre-funded Unit is equal to the price per Common Unit being sold to the public in this offering, minus $0.01. The Pre-funded Warrants will be immediately exercisable and may be exercised at any time until all of the Pre-funded Warrants are exercised in full. For each Pre-funded Unit we sell, the number of Common Units we are offering will be decreased on a one-for-one basis. We are offering a maximum of 20,270,270 Pre-funded Units. Because we will issue one Warrant as part of each Common Unit or Pre-funded Unit, the number of Warrants sold in this offering will not change as a result of a change in the mix of the Common Units and Pre-funded Units sold. This prospectus also relates to the offering of the shares of our common stock issuable upon exercise of the Pre-funded Warrants.

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Warrants offered	Each Warrant included in the Common Units will have an exercise price per share of common stock equal to 120% of the public offering price per Common Unit, will be immediately exercisable and will be exercisable for five years from the date of issuance. This prospectus also relates to the offering of the shares of our common stock issuable upon exercise of the Warrants.
Common stock to be outstanding immediately following this offering	49,308,689 shares assuming we sell only Common Units in this offering at an assumed public offering price of $1.48 per Common Unit, the last sale price per share of our common stock on June 8, 2018 as reported on the Nasdaq Global Market and assuming no exercise of the Warrants being offered in this offering.
Use of proceeds	We plan to use the net proceeds from this offering to fund our planned Phase 3 clinical trial of edasalonexent for the treatment of Duchenne muscular dystrophy, as well as for working capital and general corporate purposes. Based on our planned use of the net proceeds from this offering and our existing cash and cash equivalents, we estimate that such funds will be sufficient to enable us to obtain top-line data from our planned Phase 3 clinical trial of edasalonexent, and fund our operating expenses, debt service and capital expenditure requirements at least into the second quarter of 2020. See the "Use of Proceeds" section in this prospectus for a more complete description of the intended use of proceeds from this offering.
Risk factors	You should read the "Risk Factors" section of this prospectus beginning on page 12 hereof and the "Risk Factors" section included in our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, which is incorporated by reference, for a discussion of factors to consider carefully before deciding to invest in our securities.

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Nasdaq Global Market symbol	Our common stock is listed on the Nasdaq Global Market under the symbol "CATB". There is no established public trading market for the Warrants or the Pre-funded Warrants, and we do not expect a market to develop. We do not intend to apply for listing of the Warrants or the Pre-funded Warrants on any securities exchange or other nationally recognized trading system. Without an active trading market, the liquidity of the Warrants or the Pre-funded Warrants will be limited.

The number of shares of our common stock to be outstanding after this offering is based on 29,035,502 shares of our common stock outstanding as of April 30, 2018.

The number of shares of our common stock to be outstanding after this offering excludes:

- 3,660,951 shares of our common stock issuable upon the exercise of stock options outstanding as of April 30, 2018 at a weighted-average exercise price of $3.76 per share;
- 954,642 shares of our common stock available for future issuance as of April 30, 2018 under our 2015 stock incentive plan;
- 24,566 shares of our common stock issuable upon the exercise of warrants outstanding as of April 30, 2018, at an exercise price of $12.2114 per share; and
- 760,111 shares of our common stock available for future issuance as of April 30, 2018 under our 2015 employee stock purchase plan.

Unless otherwise indicated, all information in this prospectus assumes:

- no exercise of the outstanding options or warrants described in the bullets above; and
- no sale of Pre-funded Units in this offering and no exercise of the Warrants being offered in this offering.

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RISK FACTORS

Investing in our securities involves a high degree of risk. Before you decide to invest in our securities, you should consider carefully the risks described below and the risks discussed under the section entitled "Risk Factors" in our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018, which is incorporated by reference herein, together with the other information contained in this prospectus and the information incorporated by reference herein and in any free writing prospectus that we may authorize for use in connection with this offering. We believe the risks described below and incorporated by reference herein are the risks that are material to us as of the date of this prospectus. If any of these risks actually occur, our business, financial condition, results of operations and future growth prospects could be materially and adversely affected. In these circumstances, the market price of our common stock could decline, and you may lose all or part of your investment.

Risks Related to Our Financial Position and Need for Additional Capital

Even if this offering is successful, we will need substantial additional funding. If we are unable to raise capital when needed, we could be forced to delay, reduce or eliminate our product development programs or commercialization efforts.

Developing pharmaceutical products, including conducting preclinical studies and clinical trials, is a very time-consuming, expensive and uncertain process that takes years to complete. We expect our expenses to increase, if and to the extent of certain ongoing activities, particularly if we initiate new clinical trials of our product candidates, such as our planned Phase 3 clinical trial of edasalonexent for the treatment of Duchenne muscular dystrophy, or DMD, or initiate new research and preclinical development efforts for and seek marketing approval for, our product candidates. In addition, if we obtain marketing approval for any of our product candidates, we may incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution to the extent that such sales, marketing, manufacturing and distribution are not the responsibility of a future collaborator. Furthermore, we have incurred and will continue to incur significant additional costs associated with operating as a public company. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. If we are unable to raise capital when needed or on attractive terms, we may be forced to delay, reduce or eliminate our research and development programs or any future commercialization efforts. For example, we have recently elected to abandon certain patents related to development of certain product candidates, other than those directed to edasalonexent and CAT-5571.

We will be required to expend significant funds in order to advance the development of edasalonexent. Even if this offering is successful, we will not have sufficient funding to complete clinical development or commercialization of edasalonexent. Accordingly, we will need to raise additional funding and such funding may not be available to us on acceptable terms, on a timely basis or at all. In the event that we are unable to obtain such funding on acceptable terms and in a timely manner or at all, we may not be able to complete the clinical development or commercialization of edasalonexent.

Further, our ability to obtain additional debt financing may be limited by covenants we have made under our loan and security agreement, with MidCap Financial Trust, or MidCap, Flexpoint MCLS SPV LLC, or Flexpoint, and Square 1 Bank, or Square 1, including our negative pledge with respect to intellectual property in favor of Flexpoint and Square 1, as well as our pledge to MidCap, Flexpoint and Square 1 of substantially all of our assets, other than our intellectual property, as collateral. Our failure to raise capital on acceptable terms as and when needed would have a material adverse effect on our business, results of operations, financial condition and ability to pursue our business strategy.

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We believe that the anticipated net proceeds from this offering, together with our existing cash, will enable us to obtain top-line data from our planned Phase 3 clinical trial of edasalonexent for the treatment of DMD and fund operations into the second quarter of 2020. Without giving effect to the anticipated net proceeds from this offering, we expect that our existing cash will be sufficient to fund operations through December 2018. Based on our available cash resources, we do not have sufficient cash on hand to support current operations for at least the next twelve months from the date of filing our Quarterly Report on Form 10-Q for the quarterly period ended March 31, 2018. This condition raises substantial doubt about our ability to continue as a going concern.

Our estimate as to how long we expect our cash and cash equivalents to be able to fund our operations is based on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. Further, changing circumstances, some of which may be beyond our control, could cause us to consume capital significantly faster than we currently anticipate, and we may need to seek additional funds sooner than planned. Changes in estimates and assumptions underlying our operating plan could impact our ability to continue as a going concern for a period of one year from the date of issuance of the financial statements contained in the registration statement of which this prospectus is a part. We believe that the impact of these changes would be mitigated by our ability to significantly delay or reduce certain direct program expenditures. Our future funding requirements, both short-term and long-term, will depend on many factors, including:

- the progress, timing, costs and results of clinical trials of, and research and preclinical development efforts for, our product candidates and potential product candidates, including current and future clinical trials;
- our ability to enter into and the terms and timing of any additional collaborations, licensing or other arrangements that we may establish;
- the number and characteristics of future product candidates that we pursue and their development requirements;
- the outcome, timing and costs of seeking regulatory approvals;
- the costs of commercialization activities for any of our product candidates that receive marketing approval to the extent such costs are not the responsibility of any future collaborators, including the costs and timing of establishing product sales, marketing, distribution and manufacturing capabilities;
- subject to receipt of marketing approval, revenue, if any, received from commercial sales of our product candidates;
- our headcount growth and associated costs as we expand our research and development and establish a commercial infrastructure;
- the costs of preparing, filing and prosecuting patent applications, maintaining and protecting our intellectual property rights and defending against intellectual property related claims; and
- the costs of operating as a public company.

Our independent registered public accounting firm has included an explanatory paragraph relating to our ability to continue as a going concern in its report on our audited financial statements included in this prospectus.

The report from our independent registered public accounting firm for the year ended December 31, 2017 includes an explanatory paragraph stating that our recurring losses from operations since inception and required additional funding to finance our operations raise substantial doubt about our

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ability to continue as a going concern. If we are unable to obtain sufficient funding, our business, prospects, financial condition and results of operations will be materially and adversely affected, and we may be unable to continue as a going concern. If we are unable to continue as a going concern, we may have to liquidate our assets and may receive less than the value at which those assets are carried on our audited financial statements, and it is likely that investors will lose all or a part of their investment. After this offering, future reports from our independent registered public accounting firm may also contain statements expressing substantial doubt about our ability to continue as a going concern. If we seek additional financing to fund our business activities in the future and there remains substantial doubt about our ability to continue as a going concern, investors or other financing sources may be unwilling to provide additional funding to us on commercially reasonable terms or at all.

Risks Related to this Offering

If you purchase securities in this offering, you will suffer immediate dilution of your investment.

The public offering prices of the Common Units and the Pre-funded Units are substantially higher than the net tangible book value per share of our common stock. Therefore, if you purchase securities in this offering, you will pay an effective price per share of common stock you acquire that substantially exceeds our net tangible book value per share after this offering. Based on an assumed public offering price of $1.48 per Common Unit, the last sale price per share of our common stock on June 8, 2018, as reported on the Nasdaq Global Market, and assuming no sale of any Pre-funded Units in this offering, no exercise of the Warrants being offered in this offering, no value is attributed to such Warrants and such Warrants are classified as and accounted for as equity, you will experience immediate dilution of $0.65 per share, representing the difference between our as adjusted net tangible book value per share after giving effect to this offering and the assumed public offering price of the Common Units. In addition, if previously issued options to acquire common stock are exercised at prices below the offering price or the Warrants are accounted for as liabilities, you will experience further dilution. For a further description of the dilution that you will experience immediately after this offering, see "Dilution."

There is no public market for the Pre-Funded Warrants or the Warrants to purchase shares of our common stock being offered by us in this offering.

There is no established public trading market for the Pre-Funded Warrants or the Warrants being offered in this offering, and we do not expect a market to develop. In addition, we do not intend to apply to list the Pre-Funded Warrants or the Warrants on any national securities exchange or other nationally recognized trading system, including the Nasdaq Global Market. Without an active market, the liquidity of the Pre-Funded Warrants and the Warrants will be limited.

You may experience future dilution as a result of future equity offerings.

In order to raise additional capital, we may in the future offer additional shares of our common stock or other securities convertible into or exchangeable for our common stock at prices that may not be the same as the public offering prices of the Common Units and the Pre-funded Units in this offering. We may sell shares or other securities in any other offering at prices that are less than the prices paid by investors in this offering, and investors purchasing shares or other securities in the future could have rights superior to existing stockholders. The prices per share at which we sell additional shares of our common stock, or securities convertible or exchangeable into common stock, in future transactions may be higher or lower than the prices paid by investors in this offering.

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We have broad discretion over the use of our cash and cash equivalents, including the net proceeds we receive in this offering, and may not use them effectively.

Our management has broad discretion to use our cash and cash equivalents, including the net proceeds we receive in this offering, to fund our operations and could spend these funds in ways that do not improve our results of operations or enhance the value of our common stock. The failure by our management to apply these funds effectively could result in financial losses that could have a material adverse effect on our business, cause the price of our common stock to decline and delay the development of our product candidates. Pending their use to fund operations, we may invest our cash and cash equivalents in a manner that does not produce income or that loses value.

Holders of Pre-funded Warrants and Warrants purchased in this offering will have no rights as common stockholders until such holders exercise their Pre-funded Warrants or Warrants and acquire our common stock.

Until holders of Pre-funded Warrants or Warrants acquire shares of our common stock upon exercise thereof, such holders will have no rights with respect to the shares of our common stock underlying the Pre-funded Warrants and the Warrants. Upon exercise of the Pre-funded Warrants or Warrants, the holders will be entitled to exercise the rights of a common stockholder only as to matters for which the record date occurs after the exercise date.

The Warrants are speculative in nature.

The Warrants do not confer any rights of common stock ownership on their holders, such as voting rights or the right to receive dividends, but rather merely represent the right to acquire shares of common stock at a fixed price for a limited period of time. Specifically, commencing on the date of issuance, holders of the Warrants may exercise their right to acquire the common stock and pay an exercise price per share equal to 120% of the public offering price per Common Unit, subject to certain adjustments, prior to five years from the date of issuance, after which date any unexercised Warrants will expire and have no further value. Moreover, following this offering, the market value of the Warrants, if any, is uncertain and there can be no assurance that the market value of the Warrants will equal or exceed their imputed offering price. The Warrants will not be listed or quoted for trading on any market or exchange. There can be no assurance that the market price of the common stock will ever equal or exceed the exercise price of the Warrants, and consequently, it may not ever be profitable for holders of the Warrants to exercise the Warrants.

We might not be able to utilize a significant portion of our net operating loss carryforwards and tax credit carryforwards.

As of December 31, 2017, we had approximately $152.1 million of federal and $150.4 million of state net operating loss carryforwards to offset future taxable income, if any. Such net operating loss carryforwards expire at varying times through the year 2037, if not utilized. We had approximately $4.5 million of federal and $1.8 million of state tax credit carryforwards available to reduce future tax liabilities as of December 31, 2017, which will expire at varying times through the year 2037. The Internal Revenue Code of 1986, as amended, or the Code, provides for a limitation on the annual use of net operating losses and other tax attributes (such as research and development tax credit carryforwards) in certain circumstances. Under Section 382 of the Code and corresponding provisions of state law, if a corporation undergoes an "ownership change," which is generally defined as a greater than 50% change, by value, in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes to offset its

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post-change income may be limited. At this time, we have not completed a study to assess whether an ownership change under Section 382 of the Code has occurred, or whether there have been multiple ownership changes since our formation, due to the costs and complexities associated with such a study. We may have experienced various ownership changes, as defined by the Code, as a result of past financing transactions, and we may experience ownership changes in the future as a result of subsequent changes in our stock ownership, including this offering, some of which may be outside of our control. Accordingly, our ability to utilize the aforementioned carryforwards may be limited. Additionally, U.S. tax laws limit the time during which these carryforwards may be applied against future taxes. Therefore, we may not be able to take full advantage of these carryforwards for federal or state income tax purposes.