As filed with the Securities and Exchange Commission on May 12, 2020

Registration No. 333-

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

FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933

PHIO PHARMACEUTICALS CORP.
(Exact name of Registrant as specified in its charter)

Delaware	**2834**	**45-3215903**
(State or other jurisdiction of incorporation or organization)	*(Primary Standard Industrial Classification Code Number)*	*(I.R.S. Employer Identification Number)*

257 Simarano Drive, Suite 101
Marlborough, Massachusetts 01752
(508) 767-3861
(Address, including zip code, and telephone number, including area code, of Registrant's principal executive offices)

Gerrit Dispersyn, Dr. Med. Sc.
President & CEO
Phio Pharmaceuticals Corp.
257 Simarano Drive, Suite 101
Marlborough, Massachusetts 01752
(508) 767-3861
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

Ryan A. Murr
Gibson, Dunn & Crutcher LLP
555 Mission Street, Suite 3000
San Francisco, CA 94105
Telephone: (415) 393-8373
Facsimile: (415) 374-8430

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

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. ☒

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

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

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, 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	☐	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 7(a)(2)(B) of the Securities Act. ☐

CALCULATION OF REGISTRATION FEE

Title of each class of securities to be registered	Amount to be registered (1)(2)	Proposed maximum offering price per share (3)	Proposed maximum aggregate offering Price (3)	Amount of registration fee
Common Stock, par value $0.0001 per share	1,841,544	$2.11	$3,885,657.84	$504.36

(1) Represents shares of Common Stock, par value $0.0001 per share, which may be sold by the selling stockholders named in this registration statement. Pursuant to Rule 416 of the Securities Act of 1933, as amended, this registration statement also covers such an indeterminate amount of shares of Common Stock as may become issuable to prevent dilution resulting from stock splits, stock dividends and similar events.

(2) Represents 1,713,064 shares of Common Stock that are issuable upon the exercise of certain warrants issued pursuant to a securities purchase agreement with the selling stockholders named herein and 128,480 shares of Common Stock that are issuable upon exercise of certain warrants issued to our placement agent pursuant to an engagement letter.

(3) Calculated pursuant to Rule 457(c), solely for the purpose of computing the amount of the registration fee, on the basis of the average of the high and low prices of the registrant's Common Stock quoted on The Nasdaq Capital Market on May 5, 2020.

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

The information in this preliminary prospectus is not complete and may be changed. These securities may not be sold 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 an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

Subject to completion, dated May , 2020

Preliminary Prospectus

Up to 1,841,544 Shares of Common Stock

Pursuant to this prospectus, the selling stockholders identified herein (the "**Selling Stockholders**") are offering on a resale basis an aggregate of 1,841,544 shares of common stock, par value $0.0001 per share (the "**Common Stock**), of Phio Pharmaceuticals Corp. ("**Phio**," "**we**," "**our**" or the "**Company**"), a Delaware corporation, 1,713,064 shares of which are issuable upon the exercise of outstanding warrants (the "**Warrants**") purchased pursuant to a securities purchase agreement by and among the Company and the Selling Stockholders, dated March 31, 2020 (the "**Purchase Agreement**") as well as 128,480 shares of which are issuable upon the exercise of Warrants issued to the Company's financial advisor in connection with the Purchase Agreement. We will not receive any of the proceeds from the sale by the Selling Stockholders of the Common Stock. Upon any exercise of the Warrants by payment of cash, however, we will receive the exercise price of the Warrants.

The Selling Stockholders may sell or otherwise dispose of the Common Stock covered by this prospectus in a number of different ways and at varying prices. We provide more information about how the Selling Stockholders may sell or otherwise dispose of the Common Stock covered by this prospectus in the section entitled "Plan of Distribution" on page 9. Discounts, concessions, commissions and similar selling expenses attributable to the sale of Common Stock covered by this prospectus will be borne by the Selling Stockholders. We will pay all expenses (other than discounts, concessions, commissions and similar selling expenses) relating to the registration of the Common Stock with the Securities and Exchange Commission.

Our common stock is listed on The Nasdaq Capital Market under the symbol "PHIO." On May 11, 2020, the last reported sale price of our common stock on The Nasdaq Capital Market was $2.61 per share.

Investing in our securities involves a high degree of risk. Before making any investment in these securities, you should consider carefully the risks and uncertainties described in the section entitled "Risk Factors" beginning on page 6 of this prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense. The securities are not being offered in any jurisdiction where the offer is not permitted.

The date of this prospectus is May , 2020

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CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements can be identified by words such as “intends,” “believes,” “anticipates,” “indicates,” “plans,” “expects,” “suggests,” “may,” “would,” “should,” “potential,” “designed to,” “will,” “ongoing,” “estimate,” “forecast,” “predict,” “could,” and similar references, although not all forward-looking statements contain these words. Forward-looking statements are neither historical facts nor assurances of future performance. These statements are based only on our current beliefs, expectations and assumptions regarding the future of our business, future plans and strategies, projections, anticipated events and trends, the economy and other future conditions. Because forward-looking statements relate to the future, they are subject to inherent uncertainties, risks and changes in circumstances that are difficult to predict and many of which are outside of our control. Risks that could cause actual results to vary from expected results expressed in our forward-looking statements include, but are not limited to:

- our business and operations may be materially and adversely affected by the recent coronavirus outbreak;
- our product candidates are in an early stage of development and may fail or experience significant delays or may never advance to the clinic, which may materially and adversely impact our business;
- we are dependent on collaboration partners for the successful development of our adoptive cell therapy product candidates;
- the approach we are taking to discover and develop novel therapeutics using RNAi may never lead to marketable products;
- a number of different factors could prevent us from advancing into clinical development, obtaining regulatory approval, and ultimately commercializing our product candidates on a timely basis, or at all;
- the FDA could impose a unique regulatory regime for our therapeutics;
- we may be unable to protect our intellectual property rights licensed from other parties; our intellectual property rights may be inadequate to prevent third parties from using our technologies or developing competing products; and we may need to license additional intellectual property from others;
- we are subject to significant competition and may not be able to compete successfully;
- if we fail to attract, hire and retain qualified personnel, we may not be able to design, develop, market or sell our products or successfully manage our business;
- future financing may be obtained through, and future development efforts may be paid for by, the issuance of debt or equity, which may have an adverse effect on our stockholders or may otherwise adversely affect our business; and
- the price of our common stock has been and may continue to be volatile.

Our actual results and financial condition may differ materially from those indicated in the forward-looking statements as a result of the foregoing factors, as well as those identified in this prospectus under the heading “Risk Factors” and in other filings the Company periodically makes with the Securities and Exchange Commission (the “**SEC**”). Therefore, you should not rely unduly on any of these forward-looking statements. Forward-looking statements contained in this prospectus speak as of the date hereof and the Company does not undertake to update any of these forward-looking statements to reflect a change in its views or events or circumstances that occur after the date of this report.

PROSPECTUS SUMMARY

The following summary highlights certain information contained elsewhere in this prospectus and the documents incorporated by reference herein. This summary provides an overview of selected information and does not contain all of the information you should consider in making your investment decision. Therefore, you should read the entire prospectus and the documents incorporated by reference herein carefully before investing in our securities. Investors should carefully consider the information set forth under "Risk Factors" beginning on page 6 of this prospectus and the financial statements and other information incorporated by reference in this prospectus. In this prospectus, unless otherwise noted, (1) the term "Phio" refers to Phio Pharmaceuticals Corp. and our subsidiary, MirImmune, LLC and (2) the terms "Company," "we," "us," and "our" refer to the ongoing business operations of Phio and MirImmune, LLC, whether conducted through Phio or MirImmune, LLC.

Overview

Phio Pharmaceuticals Corp. is a biotechnology company developing the next generation of immuno-oncology therapeutics based on our self-delivering RNAi ("**INTASYL™**") therapeutic platform. Our efforts are focused on silencing tumor-induced suppression of the immune system through our proprietary INTASYL platform with utility in immune cells and the tumor micro-environment. Our goal is to develop powerful INTASYL therapeutic compounds that can weaponize immune effector cells to overcome tumor immune escape, thereby providing patients a powerful new treatment option that goes beyond current treatment modalities.

Our development efforts are based on our broadly patented INTASYL technology platform. Our INTASYL compounds do not require a delivery vehicle to penetrate into tissues and cells and are designed to "silence" or down-regulate, the expression of a specific gene which is over-expressed in cancer. We believe that our INTASYL platform uniquely positions the Company in the field of immuno-oncology because of this and the following reasons:

- Efficient uptake of INTASYL to immune cells obviating the need for facilitated delivery (mechanical or formulation);
- Can target multiple genes (i.e. multiple immunosuppression pathways) in a single therapeutic entity;
- Gene silencing by INTASYL has been shown to have a sustained, or long-term, effect *in vivo*;
- Favorable clinical safety profile of INTASYL with local administration; and
- Can be readily manufactured under current good manufacturing practices.

The self-delivering nature of our compounds makes INTASYL ideally suited for use with adoptive cell transfer ("**ACT**") treatments and direct therapeutic use. ACT consists of the infusion of immune cells with antitumor properties. These cells can be derived from unmodified (i.e. naturally occurring) immune cells, immune cells isolated from resected tumors, or genetically engineered immune cells recognizing tumor neoantigen/neoepitope cells.

Currently, ACT therapies for the treatment of solid tumors face several hurdles. Multiple inhibitory mechanisms restrain immune cells used in ACT from effectively eradicating tumors, including immune checkpoints, reduced cell fitness and cell persistence. Furthermore, the immunosuppressive tumor micro-environment (the "**TME**") can pose a formidable barrier to immune cell infiltration and function.

We have developed a product platform based on our INTASYL technology that allows easy, precise, rapid, and selective non-genetically modified programming of ACT cells (*ex vivo*, during manufacturing) and of the TME (*in vivo*, by local application), resulting in improved immunotherapy.

Adoptive Cell Transfer

ACT includes a number of different types of immunotherapy treatments. These treatments use immune cells, that are grown in a lab to large numbers, followed by administering them to the body to fight the cancer cells. Sometimes, immune cells that naturally recognize a tumor are used, while other times immune cells are modified or "engineered" to make them recognize and kill the cancer cells. There are several types of ACT, including: a.) non-engineered cell therapy in which immune cells are grown from the patient's tumor or blood, such as tumor infiltrating lymphocytes ("**TILs**"), or from donor blood or tissue such as natural killer ("**NK**") cells, dendritic cells ("**DC**") and macrophages, and b.) engineered immune cells that are genetically modified to recognize specific tumor proteins and to remain in an activated state (such as T cell receptor technology ("**TCRs**"), chimeric antigen receptor ("**CAR**") T cells, or CAR-NK cells).

In ACT, immune cells are isolated from patients, donors or retrieved from allogeneic immune cell banks. The immune cells are then expanded and modified before being returned and used to treat the patient. We believe our INTASYL compounds are ideally suited to be used in combination with ACT, in order to make these immune cells more effective.

Our approach builds on well-established methodologies of ACT and involves the treatment of immune cells with our INTASYL compounds *ex vivo* while they are grown in the lab and before administering them to the patient. Because our INTASYL compounds do not require a delivery vehicle to penetrate into the cells, we are able to enhance the function of these cells by merely adding our INTASYL compounds during the expansion process and without the need for genetic engineering. This step uses our INTASYL technology to reduce or eliminate the expression of genes that make the immune cells less effective. For example, with our INTASYL compounds, we can reduce the expression of immunosuppressive proteins by the therapeutic immune cells, potentially enabling them to overcome tumor resistance mechanisms and thus improving their ability to destroy the tumor cells. In various types of immune cells tested to date, INTASYL treatment results in potent silencing while maintaining close to 100% transfection efficiency and nearly full cell viability. After enhancing these cells *ex vivo*, they are returned to the patient for treatment.

Our lead product candidate and most advanced program being developed in ACT is PH-762, an INTASYL compound that targets the checkpoint protein PD-1. Checkpoint proteins, such as PD-1, normally act as a type of "off switch" that prevents T cells from attacking certain cells, such as cancer cells, in the body. Our T cells are immune cells that protect the body from cancer cells and are important for the activation of immune cells to fight infection.

Data developed by Phio and with collaborators has shown that PH-762 can silence PD-1 checkpoint expression, thereby removing the "off switch" and resulting in enhanced T cell activation and tumor cytotoxicity. Data released in November 2019 further supported the application of INTASYL technology in immunotherapy of cancer. PH-762 was shown to silence the expression of PD-1 in target human T cells in a potent and durable manner suitable for both ACT and intra-tumoral injection and was also shown to increase function of patient derived TILs for ACT.

We are also developing our INTASYL compound PH-804 for use in ACT. PH-804 targets the suppressive immune receptor TIGIT, which is a checkpoint protein present on T cells and NK cells. To date, we have shown that PH-804 can silence the expression of TIGIT in NK cells and T cells, overcoming their "off switch" and the cells becoming "weaponized" to kill cancer cells.

Our third recently announced product candidate is PH-894, an INTASYL compound that targets BRD4, a regulator of gene expression impacting cell differentiation. In previous studies, PH-894 has been shown to improve T cell function and persistence by differentiating T cells into a more active state (effector memory phenotype). Data, completed in partnership with the Karolinska Institutet, presented in November 2019 demonstrated that the application of PH-894, was shown to silence BRD4 in human T cells during expansion for ACT, which has the potential to confer superior anti-tumor activity. With this data, as well as results with several compounds in both T cells and NK cells, we announced the expansion of our collaboration with the Karolinska Institutet in November 2019 to build upon these findings and develop INTASYL compounds for additional targets and cell types toward clinical application in areas of the Karolinska Institutet's ongoing clinical research.

In March 2020, we entered into a collaboration and option agreement with Medigene AG and the Helmholtz Zentrum München ("**HMGU**"). This three-way collaboration expands upon our outstanding research agreement with HMGU to design and develop novel candidates for the use of INTASYL compounds in ACT to enhance immune cell function. Under the agreement, Medigene AG will contribute expertise regarding clinical development, as well as proprietary research material and has the option to an exclusive license for the clinical and/or commercial development of the potential immune cell enhancers.

Tumor Micro-Environment

The TME is the environment that surrounds and feeds a tumor, including normal cells, blood vessels, immune cells, and the extracellular matrix. The TME is an immunosuppressive microenvironment that inhibits the immune system's natural ability to recognize and destroy tumor cells by negatively impacting how immunosuppressive cells are being attracted and activated. Reprogramming different components of the TME may overcome resistance to immunotherapy. Such reprogramming of the TME by INTASYL compounds through direct local administration into the tumor, could potentially become an important form of therapy. The Company has previously shown in a clinical setting that our INTASYL compounds are safe and well-tolerated following local administration, therefore we believe that our INTASYL technology can not only be used with ACT, but can also be used as an independent therapeutic platform.

We have pipeline programs in place for the development of INTASYL compounds for direct administration into the tumor, including the use of PH-762, PH-804 and PH-894 for *in situ* transfection and activation of immune cells in the TME.

Data presented in January 2020 from *in vivo* studies performed by the Company showed that intra-tumoral injection of a mouse version of PH-804 reduced the tumor growth in colorectal carcinoma tumor bearing mice, which was shown to inhibit tumor growth and was correlated with the silencing of TIGIT mRNA expression and in increase in cytotoxic effector T cells in the TME.

Building on the animal data with PH-804, the Company conducted several animal studies with a mouse version of PH-762 and with PH-894 in a validated mouse model of hepatocellular carcinoma. These studies showed that a local administration of the mouse version of PH-762 or PH-894 through intra-tumoral injection resulted in potent anti-tumoral effects. The treated animals showed a complete and statistically significant inhibition of tumor growth, whereas placebo treated animals displayed exponential tumor growth. The preclinical findings demonstrate that direct injection of INTASYL compounds can successfully infiltrate solid tumors and impact the TME by activating the immune response in animal models of solid tumors resulting in reduced tumor growth. This is one of the key challenges for many other immunotherapy platforms to be able to achieve an adequate therapeutic effect in solid tumors.

We are also investigating other relevant compounds for TME targets, such as PH-790, an INTASYL compound targeting PD-L1. PD-L1 is a protein formed by cancer cells that activate the PD-1 "off switch" on immune cells. Our approach with PH-790 is to block the formation of the PD-L1 protein, which may prevent cancer cells from inactivating T cells and attack the cancer, and will be evaluated alongside PH-762.

Corporate Information

We were incorporated in the state of Delaware in 2011 as RXi Pharmaceuticals Corporation. On November 19, 2018, the Company changed its name to Phio Pharmaceuticals Corp., to reflect its transition from a platform company to one that is fully committed to developing groundbreaking immuno-oncology therapeutics. Our executive offices are located at 257 Simarano Drive, Suite 101, Marlborough, MA 01752, and our telephone number is (508) 767-3861. The Company's website address is *http://www.phiopharma.com*. Our website and the information contained on that site, or connected to that site, is not part of or incorporated by reference into this prospectus.

THE OFFERING

The Selling Stockholders identified in this prospectus are offering on a resale basis a total of 1,841,544 shares of Common Stock issuable upon the exercise of the Warrants.

Common Stock to be offered by the Selling Stockholders	Up to 1,841,544 shares
Common Stock outstanding prior to this offering	4,580,930 shares as of May 8, 2020
Common Stock to be outstanding after this offering	6,422,474 shares
Use of proceeds:	We will not receive any proceeds from the sale of the common shares by the Selling Stockholders, except for the Warrant exercise price paid for the Common Stock offered hereby and issuable upon the exercise of the Warrants. See “Use of Proceeds” on page 7 of this prospectus.
Risk factors:	You should read the “Risk Factors” section beginning on page 6 of this prospectus for a discussion of factors to consider carefully before deciding to invest in shares of our securities.
Nasdaq Capital Market symbol:	Our common stock is listed on The Nasdaq Capital Market under the symbol “PHIO.” We do not intend to apply for listing of the Warrants on any securities exchange or nationally recognized trading system.

RISK FACTORS

Investing in our securities involves a high degree of risk. Before investing in our securities, you should carefully consider the risks, uncertainties and assumptions contained in this prospectus and discussed under the heading “Risk Factors” included in our Annual Report on Form 10-K for the year ended December 31, 2019, as revised or supplemented by subsequent filings, which are on file with the SEC and are incorporated herein by reference, and which may be amended, supplemented or superseded from time to time by other reports we file with the SEC in the future. Our business, financial condition, results of operations and future growth prospects could be materially and adversely affected by any of these risks. In these circumstances, the market price of our Common Stock could decline, and you may lose all or part of your investment.

USE OF PROCEEDS

We will not receive any of the proceeds from the sale of the Common Stock by the Selling Stockholders. The shares offered hereby are issuable upon the exercise of the Warrants. Upon exercise of such Warrants for cash, we will receive the applicable cash exercise price paid by the holders of the Warrants.

DIVIDEND POLICY

We have never paid any cash dividends and do not anticipate paying any cash dividends on our common stock in the foreseeable future. We expect to retain future earnings, if any, for use in our development activities and the operation of our business. The payment of any future dividends will be subject to the discretion of our Board of Directors and will depend, among other things, upon our results of operations, financial condition, cash requirements, prospects and other factors that our Board of Directors may deem relevant.

DETERMINATION OF OFFERING PRICE

The prices at which the shares of Common Stock covered by this prospectus may actually be sold will be determined by the prevailing public market price for shares of our Common Stock, by negotiations between the Selling Stockholders and buyers of our Common Stock in private transactions or as otherwise described in “Plan of Distribution.”

SELLING STOCKHOLDERS

This prospectus covers the possible resale by the Selling Stockholders identified in the table below of 1,841,544 shares of Common Stock issuable upon the exercise of the Warrants. The Selling Stockholders acquired the Warrants pursuant to the Purchase Agreement and we are filing the registration statement of which this prospectus is a part pursuant to the provisions of the Purchase Agreement.

The Selling Stockholders may sell some, all or none of their shares of Common Stock. We do not know how long the Selling Stockholders will hold the Warrants, whether any will exercise the Warrants, and upon such exercise, how long such Selling Stockholders will hold the shares of Common Stock before selling them, and we currently have no agreements, arrangements or understandings with the Selling Stockholders regarding the sale of any of the shares.

The following table presents information regarding the Selling Stockholders and the shares that each may offer and sell from time to time under this prospectus. The table is prepared based on information supplied to us by the Selling Stockholders without regard to ownership limitations set forth in the applicable agreements or other documents relating to such shares and without regard to initial exercise dates of warrants, including (i) all of the shares offered hereby, and (ii) to our knowledge, all other securities held by each of the Selling Shareholders as of the date hereof, and reflects their respective holdings as of May 8, 2020. No Selling Stockholder nor any affiliates of such Selling Stockholders has or have held a position or office, or had any other material relationship, with us or any of our predecessors or affiliates. Beneficial ownership is determined in accordance with Section 13(d) of the Exchange Act and Rule 13d-3 thereunder. The percentage of shares beneficially owned prior to the offering is based on 4,580,930 shares of our Common Stock actually outstanding as of May 8, 2020.

Selling Stockholder	Shares Beneficially Owned Before this Offering	Percentage of Outstanding Shares Beneficially Owned Before this Offering	Shares to be Sold in this Offering	Percentage of Outstanding Shares Beneficially Owned After this Offering
Armistice Capital Master Fund, Ltd.	1,242,101	21.33%	428,266	15.09%
CVI Investments, Inc.	657,162	12.55%	428,266	4.76%
Intracoastal Capital, LLC	555,547	10.82%	214,133	6.94%
Iroquois Capital Investment Group, LLC	91,033	1.95%	53,533	*
Iroquois Master Fund, Ltd.	198,185	4.15%	160,600	*
Sabby Volatility Warrant Master Fund, Ltd.	1,032,162	18.39%	428,266	11.65%
Noam Rubinstein	106,309	2.27%	40,471	1.42%
Craig Schwabe	9,399	*	4,336	*
Michael Vasinkevich	216,622	4.52%	82,388	2.85%
Charles Worthman	3,375	*	1,285	*

*Represents beneficial ownership of less than one percent.

PLAN OF DISTRIBUTION

The Common Stock offered by this prospectus is being offered by the Selling Stockholders. The Common Stock may be sold or distributed from time to time by each Selling Stockholder directly to one or more purchasers or through brokers, dealers, or underwriters who may act solely as agents at market prices prevailing at the time of sale, at prices related to the prevailing market prices, at negotiated prices, or at fixed prices, which may be changed. The sale of the common stock offered by this prospectus could be effected in one or more of the following methods:

- ordinary brokers' transactions;
- transactions involving cross or block trades;
- through brokers, dealers, or underwriters who may act solely as agents;
- "at the market" into an existing market for the common stock;
- in other ways not involving market makers or established business markets, including direct sales to purchasers or sales effected through agents;
- in privately negotiated transactions; or
- any combination of the foregoing.

The Selling Stockholders also may resell all or a portion of the common shares in open market transactions in reliance upon Rule 144 under the Securities Act of 1933, as amended (the "**Securities Act**"), as permitted by that rule, or Section 4(a)(1) under the Securities Act, if available, rather than under this prospectus, provided that they meet the criteria and conform to the requirements of those provisions.

In connection with sales of the Common Stock, the Selling Stockholders may enter into hedging transactions with broker-dealers or other financial institutions, which may in turn engage in short sales of the Common Stock in the course of hedging in positions they assume. The Selling Stockholders may also sell Common Stock short and if such short sale shall take place after the date that this prospectus is declared effective by the Commission, the Selling Stockholders may deliver Common Stock covered by this prospectus to close out short positions and to return borrowed shares in connection with such short sales. The Selling Stockholders may also loan or pledge common shares to broker-dealers that in turn may sell such shares, to the extent permitted by applicable law. The Selling Stockholders may also enter into option or other transactions with broker-dealers or other financial institutions or the creation of one or more derivative securities which require the delivery to such broker-dealer or other financial institution of shares offered by this prospectus, which shares such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction). Notwithstanding the foregoing, the Selling Stockholders have been advised that they may not use shares registered on this registration statement to cover short sales of our common stock made prior to the date the registration statement, of which this prospectus forms a part, has been declared effective by the SEC.

The Selling Stockholders may, from time to time, pledge or grant a security interest in some or all of the Warrants or shares of Common Stock owned by them and, if they default in the performance of their secured obligations, the pledgees or secured parties may offer and sell the common shares from time to time pursuant to this prospectus or any amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act, amending, if necessary, the list of selling stockholders to include the pledgee, transferee or other successors in interest as Selling Stockholders under this prospectus. The Selling Stockholders also may transfer and donate the shares of Common Stock in other circumstances in which case the transferees, donees, pledgees or other successors in interest will be the selling beneficial owners for purposes of this prospectus.

To the extent required, the shares of Common Stock to be sold, the names of the Selling Stockholders, the respective purchase prices and public offering prices, the names of any agents, dealer or underwriter, any applicable commissions or discounts with respect to a particular offer will be set forth in an accompanying prospectus supplement or, if appropriate, a post-effective amendment to the registration statement that includes this prospectus.

Under the securities laws of some states, the Common Stock may be sold in such states only through registered or licensed brokers or dealers. In addition, in some states the common shares may not be sold unless such shares have been registered or qualified for sale in such state or an exemption from registration or qualification is available and is complied with.

There can be no assurance that any Selling Stockholder will sell any or all of the Common Stock registered pursuant to the registration statement, of which this prospectus forms a part.

Each Selling Stockholder and any other person participating in such distribution will be subject to applicable provisions of the Exchange Act, and the rules and regulations thereunder, including, without limitation, Regulation M of the Exchange Act, which may limit the timing of purchases and sales of any of the Common Stock by the Selling Stockholder and any other participating person. Regulation M may also restrict the ability of any person engaged in the distribution of the shares of Common Stock to engage in market-making activities with respect to the Common Stock. All of the foregoing may affect the marketability of the Common Stock and the ability of any person or entity to engage in market-making activities with respect to the Common Stock.

We will pay all expenses of the registration of the Common Stock, including, without limitation, SEC filing fees and expenses of compliance with state securities or "blue sky" laws reasonably agreed to in writing by us; *provided*, *however*, that each Selling Stockholder will pay all underwriting discounts and selling commissions, if any, and any legal expenses incurred by it.

This offering will terminate on the date that all shares offered by this prospectus have been sold by each Selling Stockholder.

Our common stock is quoted on The NASDAQ Capital Market under the symbol "PHIO."

LEGAL MATTERS

Certain legal matters relating to the issuance of the securities offered by this prospectus will be passed upon for us by Gibson, Dunn & Crutcher LLP, San Francisco, California.

EXPERTS

The consolidated financial statements as of December 31, 2019 and 2018 and for each of the two years in the period ended December 31, 2019 incorporated by reference in this prospectus have been so incorporated in reliance on the report of BDO USA, LLP, an independent registered public accounting firm, incorporated herein by reference, given on the authority of said firm as experts in auditing and accounting.

WHERE YOU CAN FIND MORE INFORMATION

We are required to file annual, quarterly and current reports, proxy statements and other information with the SEC. You may read and copy any document filed by us at the SEC's Public Reference Room at 100 F Street, N.E., Washington, D.C. 20549. Our filings with the SEC are also available to the public at the SEC's Internet web site at *http://www.sec.gov*. Copies of certain information filed by us with the SEC are also available on our website at *www.phiopharma.com*. Our website is not a part of this prospectus and is not incorporated by reference in this prospectus, and you should not consider the contents of our website in making an investment decision with respect to our common stock.

We have filed a registration statement, of which this prospectus is a part, covering the securities offered hereby. As allowed by SEC rules, this prospectus does not include all of the information contained in the Registration Statement and the included exhibits, financial statements and schedules. You are referred to the Registration Statement, the included exhibits, financial statements and schedules for further information. This prospectus is qualified in its entirety by such other information.

INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

The SEC allows us to "incorporate by reference" the information we have filed with them, which means that we can disclose important information to you by referring you to those documents. The information we incorporate by reference is an important part of this prospectus, and information that we file later with the SEC will automatically update and supersede this information. The documents we are incorporating by reference are:

- Our Annual Report on Form 10-K for the year ended December 31, 2019, filed with the SEC on March 26, 2020;
- Our Quarterly Report on Form 10-Q for the period ended March 31, 2020, filed with the SEC on May 12, 2020;
- Our Current Reports on Form 8-K, filed with the SEC on January 10, 2020, January 14, 2020, February 6, 2020, February 10, 2020, February 13, 2020, March 12, 2020, and April 2, 2020; and
- The description of our common stock contained in our registration statement on Form 8-A12B filed with the SEC on February 7, 2014, including any amendment or report filed for the purpose of updating such description.

All documents we file with the SEC pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, except as to any portion of any report or document that is not deemed filed under such provisions, (1) on or after the date of filing of the registration statement containing this prospectus and prior to the effectiveness of the registration statement and (2) on or after the date of this prospectus until the earlier of the date on which all of the securities registered hereunder have been sold or the registration statement of which this prospectus is a part has been withdrawn, shall be deemed incorporated by reference in this prospectus and to be a part of this prospectus from the date of filing of those documents and will be automatically updated and, to the extent described above, supersede information contained or incorporated by reference in this prospectus and previously filed documents that are incorporated by reference in this prospectus.

Nothing in this prospectus shall be deemed to incorporate information furnished but not filed with the SEC pursuant to Item 2.02, 7.01 or 9.01 of Form 8-K.

Upon written or oral request, we will provide without charge to each person, including any beneficial owner, to whom a copy of the prospectus is delivered a copy of any or all of the reports or documents incorporated by reference herein (other than exhibits to such documents, unless such exhibits are specifically incorporated by reference herein). You may request a copy of these filings, at no cost, by writing or telephoning us at the following address: Phio Pharmaceuticals Corp., 257 Simarano Drive, Suite 101, Marlborough, Massachusetts 01752 Attention: Investor Relations, telephone: (508) 767-3861. We maintain a website at *www.phiopharma.com*. You may access our definitive proxy statements on Schedule 14A, annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and periodic amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act with the SEC free of charge at our website as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC. The information contained in, or that can be accessed through, our website is not incorporated by reference in, and is not part of, this prospectus. We have not authorized any one to provide you with any information that differs from that contained in this prospectus. Accordingly, you should not rely on any information that is not contained in this prospectus. You should not assume that the information in this prospectus is accurate as of any date other than the date of the front cover of this prospectus.

Phio Pharmaceuticals Corp.

Up to 1,841,544 Shares of Common Stock

PROSPECTUS

May , 2020

PART II

Information Not Required in Prospectus

ITEM 13. OTHER EXPENSES OF ISSUANCE AND DISTRIBUTION

The following table sets forth the fees and expenses payable in connection with the registration of the common stock hereunder. All amounts other than the SEC registration fees are estimates.

Item	Amount to be paid
SEC registration fees	$ 504.34
Legal fees and expenses	7,500.00
Accounting fees and expenses	12,500.00
Printing and miscellaneous expenses	5,000.00
Total	$ 25,504.34

ITEM 14. INDEMNIFICATION OF DIRECTORS AND OFFICERS

Section 145 of the Delaware General Corporation Law ("**DGCL**") authorizes a corporation to indemnify its directors and officers against liabilities arising out of actions, suits and proceedings to which they are made or threatened to be made a party by reason of the fact that they have served or are currently serving as a director or officer to a corporation. The indemnity may cover expenses (including attorneys' fees) judgments, fines and amounts paid in settlement actually and reasonably incurred by the director or officer in connection with any such action, suit or proceeding. Section 145 permits corporations to pay expenses (including attorneys' fees) incurred by directors and officers in advance of the final disposition of such action, suit or proceeding. In addition, Section 145 provides that a corporation has the power to purchase and maintain insurance on behalf of its directors and officers against any liability asserted against them and incurred by them in their capacity as a director or officer, or arising out of their status as such, whether or not the corporation would have the power to indemnify the director or officer against such liability under Section 145.

Our certificate of incorporation provides that we will indemnify to the fullest extent authorized or permitted by the DGCL or any other applicable law as now or hereafter in effect any person made, or threatened to be made, a defendant or witness to any action, suit or proceeding (whether civil, criminal or otherwise) by reason of the fact that he is or was a director of our corporation or by reason of the fact that such director, at our request, is or was serving any other corporation, partnership, joint venture, trust, employee benefit plan or other enterprise in any capacity. Our certificate of incorporation also provides that no amendment or repeal of the certificate of incorporation will apply to or have any effect on any right to indemnification provided in the certificate of incorporation with respect to any acts or omissions occurring prior to such amendment or repeal.

As permitted by the DGCL, our bylaws, as amended, provide that we will indemnify to the fullest extent authorized or permitted by applicable law as now or hereafter in effect any person who was or is made, or is threatened to be made, a party or is otherwise involved in any action, suit or proceeding (whether civil, criminal, administrative or investigative), by reason of the fact that he (or a person for whom he is the legal representative) is or was a director or officer of our corporation, is or was serving at our request as a director, officer, employee, member, trustee or agent of another corporation or of a partnership, joint venture, trust, nonprofit entity or other enterprise.

Consequently, no director of the corporation will be personally liable to the corporation or its stockholders for monetary damages for any breach of fiduciary duty by such a director as a director. However, notwithstanding the preceding sentence, a director will be liable to the extent provided by Delaware law (1) for any breach of the director's duty of loyalty to the corporation or its stockholders, (2) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (3) for payments of unlawful dividends or for unlawful stock repurchases or redemption, or (4) for any transaction from which the director derived an improper personal benefit.

We have entered into indemnification agreements with each of our executive officers and directors. These agreements provide that, subject to limited exceptions and among other things, we will indemnify each of our executive officers and directors to the fullest extent permitted by law and advance expenses to each indemnitee in connection with any proceeding in which a right to indemnification is available.

We also maintain insurance on behalf of any person who is or was our director, officer, trustee, employee or agent or serving at our request as a director, officer, trustee, employee or agent of another corporation, partnership, joint venture, trust, non-profit entity or other enterprise against any liability asserted against the person and incurred by the person in any such capacity, or arising out of his or her status as such.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted for directors, officers, or persons who control us, we have been informed that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

ITEM 15. RECENT SALES OF UNREGISTERED SECURITIES

In the three years preceding the filing of this registration statement, we have issued the following securities that were not registered in the Securities Act.

On August 8, 2017, the Company entered into a purchase agreement (the "**2017 Purchase Agreement**") with Lincoln Park. As a commitment fee for entering into the 2017 Purchase Agreement, the Company issued to Lincoln Park 818 shares of Company common stock at a price per share of $319.00.

On April 11, 2018, the Company issued 27,465 shares of common stock, at a price of $173.25 per share pursuant to that certain Securities Purchase Agreement dated April 9, 2018. In a concurrent private placement, we sold warrants to purchase a total of 20,599 shares of common stock at a price of $6.875 per underlying warrant share and with an exercise price of $173.25 per share. In connection with this offering, we issued warrants to purchase a total of 1,373 shares of our common stock with an exercise price of $223.00 per share to the placement agent, H.C. Wainwright & Co., LLC. We also agreed to pay the placement agent an aggregate fee equal to $367,502, which represents 7.5% of the gross proceeds received by us from the sale of the securities in the offering and concurrent private placement.

On August 7, 2019, the Company entered into a purchase agreement (the "**2019 Purchase Agreement**") with Lincoln Park. As a commitment fee for entering into the 2019 Purchase Agreement, the Company issued to Lincoln Park 9,090 shares of Company common stock at a price per share of $20.72.

As of December 31, 2019, an aggregate of 8,202 shares of common stock were reserved for issuance under the Company's ESPP, of which 118 shares of common stock have been issued under the ESPP and 8,084 shares are available for future issuances.

As of December 31, 2019, we have not sold any shares of common stock to employees, directors, and consultants for cash consideration upon the exercise of stock options and stock awards.

On February 4, 2020, the Company also commenced a private placement whereby it issued and sold warrants exercisable for an aggregate of up to 197,056 shares of Common Stock, plus an additional 14,779 shares issuable underlying warrants issued to the Company's placement agent.

On March 31, 2020, the Company also commenced a private placement whereby it issued and sold warrants exercisable for an aggregate of up to 1,713,064 shares of Common Stock, plus an additional 128,480 shares issuable underlying warrants issued to the Company's placement agent.

Unless otherwise noted, all of the transactions described in Item 15 were exempt from registration under the Securities Act pursuant to Section 4(a)(2) of the Securities Act in that such sales did not involve a public offering or under Rule 701 promulgated under the Securities Act, in that they were offered and sold either pursuant to written compensatory plans or pursuant to a written contract relating to compensation, as provided by Rule 701.

ITEM 16. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

Exhibits

Exhibit Number	Description	Incorporated by Reference Herein	
		Form	Date
3.1	Amended and Restated Certificate of Incorporation of Phio Pharmaceuticals Corp.	Current Report on Form 8-K (File No. 001-36304)	November 19, 2018
3.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of Phio Pharmaceuticals Corp.	Current Report on Form 8-K (File No. 001-36304)	January 14, 2020
3.3	Amended and Restated Bylaws of Phio Pharmaceuticals Corp.	Current Report on Form 8-K (File No. 001-36304)	November 19, 2018
4.1	Form of Warrant.	Amendment No. 1 to the Registration Statement on Form S-1 (File No. 333-203389)	May 21, 2015
4.2	Form of Warrant.	Amendment No. 3 to the Registration Statement on Form S-1 (File No. 333-214199)	December 14, 2016
4.3	Form of Warrant.	Current Report on Form 8-K (File No. 001-36304)	April 11, 2018
4.4	Form of Placement Agent Warrant.	Current Report on Form 8-K (File No. 001-36304)	April 11, 2018
4.5	Form of Warrant.	Amendment No. 1 to the Registration Statement on Form S-1 (File No. 333-221173)	September 28, 2018
4.6	Form of Pre-Funded Warrant.	Amendment No. 1 to the Registration Statement on Form S-1 (File No. 333-221173)	September 28, 2018
4.7	Form of Underwriter Warrant.	Current Report on Form 8-K (File No. 001-36304)	October 5, 2018
4.8	Form of Placement Agent Warrant.	Current Report on Form 8-K (File No. 001-36304)	November 20, 2019
4.9	Form of Warrant.	Current Report on Form 8-K (File No. 001-36304)	February 6, 2020
4.10	Form of Warrant.	Current Report on Form 8-K (File No. 001-36304)	February 13, 2020
4.11	Form of Pre-Funded Warrant.	Current Report on Form 8-K (File No. 001-36304)	February 13, 2020
4.12	Form of Underwriter Warrant.	Current Report on Form 8-K (File No. 001-36304)	February 13, 2020

4.13	Form of Warrant.	Current Report on Form 8-K (File No. 001-36304)	April 2, 2020
5.1	Opinion of Gibson, Dunn & Crutcher LLP**		
10.1	Patent and Technology Assignment Agreement between RXi Pharmaceuticals Corporation (formerly RNCS, Inc.) and Advirna, LLC, effective as of September 24, 2011.	Registration Statement on Form S-1 (File No. 333-177498)	October 25, 2011
10.2	Phio Pharmaceuticals Corporation 2012 Long Term Incentive Plan.*	Quarterly Report on Form 10-Q (File No. 001-36304)	November 12, 2019
10.3	Form of Restricted Stock Unit Award under the Company's 2012 Long Term Incentive Plan.*	Amendment No. 2 to the Registration Statement on Form S-1 (File No. 333-177498)	December 29, 2011
10.4	Form of Incentive Stock Option Award under the Company's 2012 Long Term Incentive Plan, as amended.*	Registration Statement on Form S-1 (File No. 333-191236)	September 18, 2013
10.5	Form of Non-Qualified Stock Option Award under the Company's 2012 Long Term Incentive Plan, as amended.*	Registration Statement on Form S-1 (File No. 333-191236)	September 18, 2013
10.6	RXi Pharmaceuticals Corporation Employee Stock Purchase Plan.*	Registration Statement on Form S-8 (File No. 333-277013)	August 24, 2018
10.7	Form of Indemnification Agreement.*	Amendment No. 3 to the Registration Statement on Form S-1 (File No. 333-177498)	January 23, 2012
10.8	Employment Agreement, dated April 24, 2017, between RXi Pharmaceuticals Corporation and Gerrit Dispersyn, Dr. Med. Sc.*	Post-effective Amendment No. 1 to the Registration Statement on Form S-1 (File No. 333-214199)	May 4, 2017
10.9	Lease Agreement dated December 17, 2013 between RXi Pharmaceuticals Corporation and 257 Simarano Drive, LLC, Brighton Properties, LLC, Robert Stubblebine 1, LLC and Robert Stubblebine 2, LLC.	Current Report on Form 8-K (File No. 000-54910)	December 20, 2013
10.10	First Amendment to Lease dated January 22, 2019.	Current Report on Form 8-K (File No. 001-36304)	January 28, 2019
10.11	Purchase Agreement, dated as of August 7, 2019 by and between Phio Pharmaceuticals Corp. and Lincoln Park Capital Fund, LLC.	Current Report on Form 8-K (File No. 001-36304)	August 9, 2019
10.12	First Amendment to Purchase Agreement by and between Phio Pharmaceuticals Corp. and Lincoln Park Capital Fund, LLC.	Registration Statement on Form S-1 (File No. 333-233584)	August 30, 2019

10.13	Registration Rights Agreement, dated as of August 7, 2019, by and between Phio Pharmaceuticals Corp. and Lincoln Park Capital Fund, LLC.	Current Report on Form 8-K (File No. 001-36304)	August 9, 2019
23.1	Consent of BDO USA, LLP, an Independent Registered Public Accounting Firm.**		
23.2	Consent of Gibson, Dunn & Crutcher LLP (included in Exhibit 5.1)**		
24.1	Powers of Attorney (included on the signature page of Part II of this Registration Statement on Form S-1) **		

* Indicates a management contract or compensatory plan or arrangement.
** Filed herewith.

Financial Statement Schedules

Certain schedules are omitted because they are not applicable, or are not required by smaller reporting companies.

ITEM 17. UNDERTAKINGS

Insofar as indemnification for liabilities arising under the Securities Act of 1933, as amended may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is therefore unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

(a) The undersigned Registrant hereby undertakes:

(1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:

(i) To include any prospectus required by section 10(a)(3) of the Securities Act of 1933;

(ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than 20% change in the maximum aggregate offering price set forth in the “Calculation of Registration Fee” table in the effective registration statement; and

(iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement;

Provided, *however*, that Paragraphs (a)(1)(i), (ii), and (iii) of this section do not apply if the registration statement is on Form S-1, Form S-3, Form SF-3, or Form F-3 and the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the Commission by the registrant pursuant to section 13 or section 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m or 78o(d)) that are incorporated by reference in the registration statement.

(2) That, for the purpose of determining any liability under the Securities Act of 1933, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof;

(3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering;

(4) That, for the purpose of determining liability under the Securities Act of 1933 to any purchaser:

(i) Each prospectus filed by the Registrant pursuant to Rule 424(b)(3) shall be deemed to be part of the registration statement as of the date the filed prospectus was deemed part of and included in the registration statement; and

(ii) Each prospectus required to be filed pursuant to Rule 424(b)(2), (b)(5), or (b)(7) as part of a registration statement in reliance on Rule 430B relating to an offering made pursuant to Rule 415(a)(1)(i), (vii), or (x) for the purpose of providing the information required by section 10(a) of the Securities Act of 1933 shall be deemed to be part of and included in the registration statement as of the earlier of the date such form of prospectus is first used after effectiveness or the date of the first contract of sale of securities in the offering described in the prospectus. As provided in Rule 430B, for liability purposes of the issuer and any person that is at that date an underwriter, such date shall be deemed to be a new effective date of the registration statement relating to the securities in the registration statement to which that prospectus relates, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof. Provided, however, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such effective date, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such effective date;

(5) That, for the purpose of determining liability of the registrant under the Securities Act of 1933 to any purchaser in the initial distribution of the securities: The undersigned registrant undertakes that in a primary offering of securities of the undersigned registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:

(i) Any preliminary prospectus or prospectus of the undersigned registrant relating to the offering required to be filed pursuant to Rule 424 (§ 230.424 of this chapter);

(ii) Any free writing prospectus relating to the offering prepared by or on behalf of the undersigned registrant or used or referred to by the undersigned registrant;

(iii) The portion of any other free writing prospectus relating to the offering containing material information about the undersigned registrant or its securities provided by or on behalf of the undersigned registrant; and

(iv) Any other communication that is an offer in the offering made by the undersigned registrant to the purchaser.

(b) The undersigned Registrant, hereby undertakes that, for purposes of determining any liability under the Securities Act of 1933, each filing of the Registrant's annual report pursuant to section 13(a) or section 15(d) of the Securities Exchange Act of 1934 (and, where applicable, each filing of an employee benefit plan's annual report pursuant to section 15(d) of the Securities Exchange Act of 1934) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof;

(c) The undersigned Registrant hereby undertakes that:

(i) For purposes of determining any liability under the Securities Act of 1933, the information omitted from the form of prospectus filed as part of this registration statement in reliance upon Rule 430A and contained in a form of prospectus filed by the Registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act of 1933 shall be deemed to be part of this registration statement as of the time it was declared effective.

(ii) For the purpose of determining any liability under the Securities Act of 1933, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, as amended, the Registrant has duly caused this Registration Statement on Form S-1 to be signed on its behalf by the undersigned, thereunto duly authorized, in Marlborough, Massachusetts, on May 12, 2020.

PHIO PHARMACEUTICALS CORP.

By: /s/ Gerrit Dispersyn
Gerrit Dispersyn, Dr. Med. Sc.
President and Chief Executive Officer

Power of Attorney

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Gerrit Dispersyn, Dr. Med. Sc. as attorney-in-fact, with power of substitution, in any and all capacities, to sign any and all amendments and post-effective amendments to this registration statement, and to file the same, with all exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, hereby ratifying and confirming all that said attorney-in-fact, or his substitute or substitutes, may do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

Signature	Title	Date
/s/ Gerrit Dispersyn Gerrit Dispersyn, Dr. Med. Sc.	President and Chief Executive Officer (Principal Executive Officer and Principal Financial Officer)	May 12, 2020
/s/ Caitlin Kontulis Caitlin Kontulis	Vice President of Finance & Administration and Secretary (Principal Accounting Officer)	May 12, 2020
/s/ Robert J. Bitterman Robert J. Bitterman	Director	May 12, 2020
/s/ Geert Cauwenbergh Geert Cauwenbergh, Dr. Med. Sc.	Director	May 12, 2020
/s/ H. Paul Dorman H. Paul Dorman	Director	May 12, 2020
/s/ Robert L. Ferrara Robert L. Ferrara	Director	May 12, 2020
/s/ Jonathan E. Freeman, Ph.D. Jonathan E. Freeman, Ph.D.	Director	May 12, 2020
/s/ Curtis A. Lockshin Curtis A. Lockshin, Ph.D.	Director	May 12, 2020

Exhibit 5.1

GIBSON DUNN

Gibson, Dunn & Crutcher LLP

555 Mission Street
San Francisco, CA 94105-0921
Tel 415.393.8200
www.gibsondunn.com

May 12, 2020

Phio Pharmaceuticals Corp.
257 Simarano Drive, Suite 101
Marlborough, Massachusetts 01752

Re: *Phio Pharmaceuticals Corp.*
Registration Statement on Form S-1

Ladies and Gentlemen:

We have examined the Registration Statement on Form S-1, as amended (the "Registration Statement"), of Phio Pharmaceuticals Corp., a Delaware corporation (the "Company") filed pursuant to the Securities Act of 1933, as amended (the "Securities Act"), in connection with the offering by the Company of up to 1,841,544 shares of the Company's common stock, par value $0.0001 per share (the "Shares").

In arriving at the opinions expressed below, we have examined originals, or copies certified or otherwise identified to our satisfaction as being true and complete copies of the originals, of specimen common stock certificates, and such other documents, corporate records, certificates of officers of the Company and of public officials and other instruments as we have deemed necessary or advisable to enable us to render the opinions set forth below. In our examination, we have assumed without independent investigation the genuineness of all signatures, the legal capacity and competency of all natural persons, the authenticity of all documents submitted to us as originals and the conformity to original documents of all documents submitted to us as copies.

Based upon the foregoing, and subject to the assumptions, exceptions, qualifications and limitations set forth herein, we are of the opinion that the Shares, when issued against payment thereof as set forth in the Registration Statement, will be validly issued, fully paid and non-assessable.

We consent to the filing of this opinion as an exhibit to the Registration Statement, and we further consent to the use of our name under the caption "Legal Matters" in the Registration Statement and the prospectus that forms a part thereof. In giving these consents, we do not thereby admit that we are within the category of persons whose consent is required under Section 7 of the Securities Act or the Rules and Regulations of the Commission.

Very truly yours,

/s/ Gibson, Dunn & Crutcher, LLP

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

Phio Pharmaceuticals Corp.
Marlborough, Massachusetts

We hereby consent to the incorporation by reference in the Prospectus constituting a part of this Registration Statement of our report dated March 26, 2020, relating to the consolidated financial statements of Phio Pharmaceuticals Corp., which is incorporated by reference in that Prospectus.

We also consent to the reference to us under the caption “Experts” in the Prospectus.

/s/ BDO USA, LLP
Boston, Massachusetts

May 12, 2020