

Dicerna Pharmaceuticals Inc
Form 424B5
May 19, 2015
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Filed Pursuant to Rule 424(b)(5)
Registration No. 333-202687

The information contained in this preliminary prospectus supplement and the accompanying prospectus is not complete and may be changed. A registration statement relating to these securities has been declared effective by the Securities and Exchange Commission. This preliminary prospectus supplement and the accompanying prospectus are not an offer to sell these securities and are not soliciting an offer to buy these securities in any jurisdiction where the offering is not permitted.

SUBJECT TO COMPLETION, DATED MAY 18, 2015

PRELIMINARY PROSPECTUS SUPPLEMENT

(To prospectus dated April 2, 2015)

2,750,000 Shares

Common Stock

We are offering 2,750,000 shares of our common stock. Our common stock is listed on The NASDAQ Global Select Market under the symbol DRNA. On May 15, 2015, the last reported sale price of our common stock on The NASDAQ Global Select Market was \$19.52 per share.

Investing in our common stock involves a high degree of risk. Please read Risk Factors beginning on page S-7 of this prospectus supplement, on page 8 of the accompanying prospectus and in the other documents incorporated by reference into this prospectus supplement.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus supplement or the accompanying prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

| | PER SHARE | TOTAL |
|---|------------------|--------------|
| Public Offering Price | \$ | \$ |
| Underwriting Discounts and Commissions ⁽¹⁾ | \$ | \$ |
| Proceeds to Dicerna (Before Expenses) | \$ | \$ |

⁽¹⁾ The underwriters will also be reimbursed for certain expenses incurred in this offering. See Underwriting for details.

Delivery of the shares of common stock is expected to be made on or about _____, 2015. We have granted the underwriters an option for a period of 30 days to purchase up to an additional 412,500 shares of our common stock. If the underwriters exercise the option in full, the total underwriting discounts and commissions payable by us will be \$ _____ and the total proceeds to us, before expenses, will be \$ _____.

Joint Book-Running Managers

Jefferies

Leerink Partners
Lead Manager

Cowen and Company

Stifel

Prospectus Supplement dated _____, 2015

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ABOUT THIS PROSPECTUS SUPPLEMENT

In this prospectus, the terms Dicerna, Company, we, us, our and similar terms refer to Dicerna Pharmaceuticals, Delaware corporation, and its subsidiaries unless the context otherwise requires.

This prospectus supplement and the accompanying base prospectus is part of a shelf registration statement on Form S-3 that we filed with the Securities and Exchange Commission (SEC).

We provide information to you about this offering of shares of our common stock in two separate documents that are bound together: (1) this prospectus supplement, which describes the specific details regarding this offering and also adds to and updates information contained in the accompanying base prospectus and the documents incorporated by reference into this prospectus supplement and the accompanying base prospectus; and (2) the accompanying base prospectus, including the documents incorporated by reference therein, which provides general information, some of which may not apply to this offering. Generally, when we refer to this prospectus, we are referring to both documents combined. If information in this prospectus supplement is inconsistent with the accompanying base prospectus, you should rely on this prospectus supplement. However, if any statement in one of these documents is inconsistent with a statement in another document having a later date for example, a document incorporated by reference in this prospectus the statement in the document having the later date modifies or supersedes the earlier statement as our business, financial condition, results of operations and prospects may have changed since the earlier dates.

You should rely only on the information contained in, or incorporated by reference into, this prospectus and in any free writing prospectus that we may authorize for use in connection with this offering. We have not, and the underwriters, have not, authorized any other person to provide you with different information. If anyone provides you with different or inconsistent information, you should not rely on it. We and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. We and the underwriters are not, making an offer to sell or soliciting an offer to buy our securities in any jurisdiction in which an offer or solicitation is not authorized or in which the person making that offer or solicitation is not qualified to do so or to anyone to whom it is unlawful to make an offer or solicitation. You should assume that the information appearing in this prospectus, the documents incorporated by reference into this prospectus, and in any free writing prospectus that we may authorize for use in connection with this offering, is accurate only as of the date of those respective documents. Our business, financial condition, results of operations and prospects may have changed since those dates. You should read this prospectus, the documents incorporated by reference into this prospectus, and any free writing prospectus that we may authorize for use in connection with this offering, in their entirety before making an investment decision. You should also read and consider the information in the documents to which we have referred you in the sections of this prospectus entitled Where You Can Find More Information and Incorporation by Reference.

Other than in the United States, no action has been taken by us or the underwriters that would permit a public offering of the securities offered by this prospectus in any jurisdiction where action for that purpose is required. We are offering to sell, and seeking offers to buy, shares of common stock only in jurisdictions where offers and sales are permitted. The distribution of this prospectus and the offering of the common stock in certain jurisdictions may be restricted by law. The securities offered by this prospectus may not be offered or sold, directly or indirectly, nor may this prospectus or any other offering material or advertisements in connection with the offer and sale of any such securities be distributed or published in any jurisdiction, except under circumstances that will result in compliance with the applicable rules and regulations of that jurisdiction. 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 common stock and the distribution of this prospectus outside the United States. This prospectus does not constitute, and may not be used in connection with, an offer to sell, or a solicitation of an offer to buy, any securities

offered by this prospectus by any person in any jurisdiction in which it is unlawful for such person to make such an offer or solicitation.

This prospectus and the information incorporated herein by reference include trademarks, service marks and trade names owned by us or other companies. All trademarks, service marks and trade names included or incorporated by reference in this prospectus are the property of their respective owners.

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This prospectus contains summaries of certain provisions contained in some of the documents described herein, but reference is made to the actual documents for complete information. All of the summaries are qualified in their entirety by the actual documents. Copies of some of the documents referred to herein have been or will be filed as exhibits to the registration statement of which this prospectus is a part or as exhibits to documents incorporated by reference herein, and you may obtain copies of those documents as described below under the headings "Where You Can Find More Information" and "Incorporation of Certain Documents by Reference."

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PROSPECTUS SUPPLEMENT SUMMARY

*This summary highlights certain information about us, this offering and selected information contained elsewhere in or incorporated by reference into this prospectus. This summary is not complete and does not contain all of the information that you should consider before deciding whether to invest in the securities covered by this prospectus. For a more complete understanding of Dicerna and this offering, we encourage you to read and consider carefully the more detailed information in this prospectus, including the information incorporated by reference in this prospectus and the information included in any free writing prospectus that we have authorized for use in connection with this offering, including the information referred to under the heading **Risk Factors** in this prospectus beginning on page S-7 and page 8 and in the other periodic reports incorporated by reference herein.*

Overview

We are an RNA interference-based biopharmaceutical company focused on the discovery and development of innovative treatments for rare inherited diseases involving the liver and for cancers that are genetically defined. We are using our RNA interference (RNAi) technology platform to build a broad pipeline in these therapeutic areas. In both rare diseases and oncology, we are pursuing targets that have historically been difficult to inhibit using conventional approaches, but where we believe connections between targets and diseases are well understood and documented. We aim to discover, develop and commercialize these novel therapeutics either on our own or in collaboration with pharmaceutical partners. In indications such as rare diseases in which a small sales force will suffice, we seek to retain substantially all commercial rights in key markets. In oncology and other more prevalent disease areas, we may partner our product candidates while seeking to retain significant portions of the commercial rights. We have partnered two of our oncology development programs with the global pharmaceutical company Kyowa Hakko Kirin Co., Ltd. (KHK). We are eligible to receive royalties on worldwide net sales for these product candidates. In addition, we have an option to co-promote, in the U.S., a therapeutic targeting the KRAS gene for an equal share of the profits from U.S. net sales.

In choosing which development programs to advance, we apply scientific, clinical, and commercial criteria that we believe allow us to best leverage our RNAi platform and maximize value for our company. Our current development programs are as follows.

- n **DCR-PH1 for Primary Hyperoxaluria Type 1 (PH1).** We are developing DCR-PH1 for the treatment of PH1 by targeting the gene encoding the liver enzyme glycolate oxidase. PH1 is known to afflict an estimated one to three people per million of population, and may afflict as many as six to eight people per million of population, and causes severe renal disease and early mortality. In preclinical studies, we have shown that, by using our RNAi technology to inactivate the gene encoding glycolate oxidase, we can significantly reduce oxalate levels, the key pathology of PH1. We seek to begin clinical trials of DCR-PH1 in late 2015 with an IND filing in the third quarter of 2015; however, studies in non-human primates have refined our expectations for data read-out from the trial. Observations in non-human primates have demonstrated (1) substantially longer target enzyme half-life in non-human primates than in mice, and thus movement in key metabolite biomarkers takes longer to be observed, and (2) greater levels of RNAi knockdown are required for enzyme silencing in non-human primates than in mice, which suggests that we may need to achieve high levels of transcript knockdown in patients before observing biomarker changes. These phenomena suggest that higher doses may be required before observing robust biomarker response during the phase 1 trial. We therefore expect this data to emerge in the first half of 2016.

- n **Other rare inherited diseases involving the liver.** We are investigating a number of other rare diseases involving genes expressed in the liver. We have selected these diseases and disease target genes based on criteria that include having a strong therapeutic hypothesis, a readily-identified patient population, the availability of predictive biomarkers, high unmet medical need, favorable competitive positioning, and a rapid projected path to approval.

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- n **DCR-MYC for MYC-related cancers.** We are developing DCR-MYC for the treatment of various cancers by targeting the MYC gene. Multiple lines of genetic evidence implicate MYC in the initiation and progression of tumors, including natural variations in the MYC gene that predispose to certain types of cancer, and frequent genetic amplification and overexpression of MYC within tumors. In preclinical studies, inhibition of the MYC gene with DCR-MYC has shown strong anti-tumor effects in animal models of human cancers. In the second quarter of 2014, we initiated a multi-center, dose-escalating Phase 1 clinical trial of DCR-MYC to assess the safety and tolerability of DCR-MYC in patients with solid tumors, multiple myeloma, or lymphoma who are refractory or unresponsive to standard therapies. In fourth quarter of 2014, we initiated a global Phase 1b/2 clinical trial of DCR-MYC in patients with advanced hepatocellular carcinoma (HCC) with the first patient dosed in January 2015. We expect to announce top-line data from the first Phase 1 trial in 2015.
- n **Two product candidates in collaboration with KHK, including one for KRAS-related cancers.** We are developing, in collaboration with KHK, a therapeutic targeting the KRAS oncogene, a gene that is frequently mutated in numerous cancers, including non-small cell lung cancer, colorectal cancer and pancreatic cancer. Such mutations are associated with aggressive disease and resistance to current therapies. We are also developing, with KHK, a therapeutic targeting a second cancer-related gene, which we are not identifying at this time. KHK is responsible for all preclinical and clinical development activities, including the selection of patient population and disease indications for clinical trials.

Our drug discovery and development efforts are based on the therapeutic modality of RNAi, a highly potent and specific mechanism for silencing the activity of a targeted gene. In this naturally occurring biological process, double-stranded RNA molecules induce the enzymatic destruction of the messenger RNA (mRNA) of a target gene that contains sequences that are complementary to one strand of the therapeutic double-stranded RNA molecule. Our approach is to design proprietary double-stranded RNA molecules that have the potential to engage the enzyme Dicer and initiate an RNAi process to silence a specific target gene. We refer to these proprietary molecules generally as Dicer substrate short interfering RNAs (DsiRNAs) or as DsiRNA or DsiRNA-EX molecules, depending on the specific structure.

RNAi therapeutics represent a novel advance in drug development. Historically, the pharmaceutical industry has developed small molecules or antibodies to inhibit the activity of disease-causing proteins. This approach is effective for many diseases; nevertheless, many proteins cannot be inhibited by either small molecules or antibodies. Some proteins lack the binding pockets small molecules require for interaction. Other proteins are solely intracellular and therefore inaccessible to antibody-based therapeutics which are limited to cell surface and extracellular proteins.

The novel advantage of RNAi is that instead of targeting proteins, RNAi goes upstream to silence the genes themselves. In 2006, the Nobel Prize was awarded for the discovery of RNAi. That same year we incorporated with the goal of developing RNAi-based therapeutics for previously undruggable disease target genes. Rather than seeking to inhibit a protein directly, the better approach may be to prevent its creation in the first place.

We believe our approach to RNAi drug development provides the following qualities and advantages compared to other methods of inducing RNAi.

- n **We initiate RNAi through the Dicer enzyme.** DsiRNA and DsiRNA-EX molecules are structured to be processed by the enzyme Dicer, the initiation point for RNAi in the human cell cytoplasm. Unlike earlier generation RNAi molecules, which mimic the output product of Dicer processing, DsiRNA and DsiRNA-EX

molecules enter the RNAi pathway prior to Dicer processing. This can result in preferential use of the correct strand of a double-stranded RNA molecule, and therefore increase the efficacy of the RNAi mechanism. We believe this benefit increases the potency of our DsiRNA and DsiRNA-EX molecules compared to other RNAi-inducing molecules. In addition, due to processing by the Dicer enzyme, our DsiRNA and DsiRNA-EX molecules have multiple sites for chemical modification and conjugation compared to earlier RNAi technologies. At these sites we can use modifications that may

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have the potential to enhance the drug-like properties on our molecules. Specifically, we can employ modifications that enhance the pharmacokinetic profile and/or suppress immunostimulatory activity.

- n **Our DsiRNA-EX Conjugates enable subcutaneous delivery to the liver.** We have developed a proprietary subcutaneous conjugate-based delivery technology for our DsiRNA-EX molecules that enables delivery to hepatocytes in the liver as demonstrated in animal models. This technology involves conjugation of a hepatocyte-targeting ligand to the extended portion of our DsiRNA-EX molecules, and we term the entire construct a DsiRNA-EX Conjugate. This technology is well-suited to our focus on rare inherited diseases involving the liver and can generally be applied to disease target genes and viral pathogens in the liver. We intend to use DsiRNA-EX Conjugates in all future programs involving targets in the liver.

- n **Our EnCore lipid nanoparticle technology enables delivery to solid tumors.** We have developed our proprietary EnCore lipid nanoparticle (LNP) technology for delivery of DsiRNA and DsiRNA-EX molecules to tumors. The EnCore system is engineered to accumulate in tumors and mediate delivery of DsiRNA and DsiRNA-EX molecules into tumor cells. We have extensive pre-clinical data, in multiple animal models of human tumors, of effective RNAi delivery mediated by the EnCore system. We utilize this delivery system in our DCR-MYC program and intend to utilize it for future programs in oncology.

We believe we have a robust patent portfolio covering our proprietary RNAi platform. As of February 1, 2015, our patent estate included over 20 issued patents and over 70 pending patent applications covering our DsiRNA and DsiRNA-EX payload technologies and our lipid nanoparticle and conjugate delivery technologies.

Our executive management team has extensive experience in the biopharmaceutical industry. In addition, various members of our management team and our board of directors have contributed to the progress of the RNAi field through their substantial involvement in companies such as Alnylam Pharmaceuticals Inc. (Alnylam), Genta Inc., Genzyme Inc., GlaxoSmithKline plc, Pfizer Inc., Sirna Therapeutics Inc. and other companies. Our co-founder and chief executive officer, Douglas M. Fambrough III, Ph.D., was a lead venture capital investor and board member of Sirna Therapeutics, an early RNAi company acquired by Merck & Co., Inc. in 2006 for \$1.1 billion. He played a pivotal role in the restructuring of Ribozyme Pharmaceuticals into Sirna Therapeutics, the management of the company as a member of its Board of Directors, and the execution of its 2006 acquisition by Merck & Co., Inc.

Our Corporate Information

We were incorporated in Delaware in October 2006. Additional information concerning the Company is contained in the documents we file with the SEC, as described above. Our mailing address is 87 Cambridgepark Drive, Cambridge, MA 02140 where our principal executive offices are located, and our main telephone number is (617) 621-8097. We maintain a website at www.dicerna.com, which contains information about us. The information contained in, or that can be accessed through, our website is not part of, and is not incorporated into, this prospectus and should not be considered part of this prospectus.

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THE OFFERING

Common stock offered by us 2,750,000 shares

Common stock to be outstanding after this offering 20,576,776 shares (as more fully described in the notes following this table), assuming sales of 2,750,000 shares of our common stock in this offering.

Underwriters Option to Purchase Additional Shares

We have granted the underwriters an option to purchase up to 412,500 additional shares of our common stock. This option is exercisable, in whole or in part, for a period of 30 days from the date of this prospectus supplement.

Use of Proceeds

We currently intend to use the net proceeds from this offering, for preclinical studies and clinical trials, with the remainder of any net proceeds from sales of securities being used for continued technology platform development, working capital and general corporate purposes. See Use of Proceeds.

Risk Factors

Investing in our securities involves a high degree of risk. See Risk Factors beginning on page S-7 and page 8 of this prospectus and the other information included in, or incorporated by reference into, this prospectus for a discussion of certain factors that you should carefully consider before deciding to invest in shares of our common stock.

NASDAQ Global Select Market Symbol

Our common stock is listed on The NASDAQ Global Select Market under the symbol DRNA.

The number of shares of our common stock shown above to be outstanding immediately after this offering is based on 17,826,776 shares outstanding as of May 15, 2015 and excludes as of such date:

- n 87,901 shares of our common stock issuable upon the exercise of outstanding warrants, at a weighted average exercise price of \$13.08 per share;
- n 4,223,248 shares of our common stock issuable upon the exercise of outstanding options, at a weighted average exercise price of \$12.37 per share; and
- n 176,123 shares of our common stock available for future issuance pursuant to our existing stock incentive plans.

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RISK FACTORS

An investment in our securities is speculative in nature and involves a high degree of risk. Before deciding whether to invest in our securities, you should consider carefully the risks discussed below, together with the risks under the heading Risk Factors in Part I Item 1A of our Annual Report on Form 10-K for the fiscal year ended December 31, 2014 and our subsequent reports filed with the SEC, which are incorporated by reference into this prospectus, as well as the other information in this prospectus, the information and documents incorporated by reference and in any free writing prospectus that we have authorized for use in connection with this offering. If any of the identified risks actually occur, they could materially adversely affect our business, financial condition, operating results or prospects and the trading price of our securities. Additional risks and uncertainties that we do not presently know or that we currently deem immaterial may also impair our business, financial condition, operating results and prospects and the trading price of our securities. As a result, you could lose all or part of your investment. You should also be aware that this document and other public statements we make may contain statements that do not relate strictly to historical fact, any of which may be forward-looking statements within the meaning of the U.S. Private Securities Litigation Reform Act of 1995.

Additional Risks Related to This Offering

We have broad discretion in the use of the net proceeds from this offering.

Our management will have broad discretion in the application of the net proceeds from this offering and could spend the proceeds in ways with which you may not agree. Accordingly, you will be relying on the judgment of our management with regard to the use of the net proceeds, and you will not have the opportunity, as part of your investment decision, to assess whether the proceeds are being used appropriately. It is possible that the net proceeds will be invested or otherwise used in a way that does not yield a favorable, or any, return for the Company.

Investors in this offering will experience immediate and substantial dilution in the net tangible book value per share of the common stock they purchase.

Since the price per share of our common stock being offered is higher than the net tangible book value per share of our common stock, you will suffer substantial dilution in the net tangible book value of the common stock you purchase in this offering. See the section entitled Dilution in this prospectus for a more detailed discussion of the dilution you will incur if you purchase common stock in this offering. In addition, we have a significant number of options outstanding. If the holders of these options exercise such options, you may incur further dilution.

Our stockholders may experience significant dilution as a result of future equity offerings and exercise of outstanding options.

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. We cannot assure you that we will be able to sell shares or other securities in any other offering at a price per share that is equal to or greater than the price per share paid by investors in this offering, and investors purchasing shares or other securities in the future could have rights superior to existing stockholders. The price per share at which we sell additional shares of our common stock or other securities convertible into or exchangeable for our common stock in future transactions may be higher or lower than the price per share in this offering.

In addition, we have a significant number of securities convertible into, or allowing the purchase of, our common stock. As of May 15, 2015, 176,123 shares of common stock were reserved for future issuance under our stock

incentive plans. Our stock incentive plans also provide for annual increases in the number of shares available for issuance. As of that date, there were also options to purchase 4,223,248 shares of our common stock outstanding and warrants to purchase 87,901 shares of our common stock outstanding. The exercise of outstanding options or warrants having an exercise price per share that is less than the offering price per share in this offering will increase dilution to investors in this offering.

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Future sales of our common stock in the public market could cause our stock price to fall.

Sales of a substantial number of shares of our common stock in the public market, or the perception that these sales might occur, could depress the market price of our common stock and could impair our ability to raise capital through the sale of additional equity securities. As of May 15, 2015, we had 17,826,776 shares of common stock outstanding, all of which shares, other than shares held by our directors and certain officers, were eligible for sale in the public market, subject in some cases to compliance with the requirements of Rule 144, including the volume limitations and manner of sale requirements. In addition, shares of common stock issuable upon exercise of outstanding options and shares reserved for future issuance under our stock incentive plans will become eligible for sale in the public market to the extent permitted by applicable vesting requirements and subject in some cases to compliance with the requirements of Rule 144.

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

Certain statements contained or incorporated by reference in this prospectus and any related free writing prospectus constitute forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995 and releases issued by the SEC and within the meaning of Section 27A of the Securities Act of 1933, as amended (Securities Act), and Section 21E of the Securities Exchange Act of 1934, as amended (Exchange Act). From time to time, we publish forward-looking statements relating to matters such as anticipated financial performance, business prospects, technological developments, new products, research and development activities and other aspects of our present and future business operations as well as similar matters.

Forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause our or our industry's actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by such forward-looking statements. While it is impossible to identify or predict all such matters, these differences may result from, among other things, the inherent uncertainty of the timing and success of, and expense associated with, research, development, regulatory approval and commercialization of our products and product candidates, including the risks that clinical trials will not commence or proceed as planned; products appearing promising in early trials will not demonstrate efficacy or safety in larger-scale trials; clinical trial data on our products and product candidates will be unfavorable; our products will not receive marketing approval from regulators or, if approved, do not gain sufficient market acceptance to justify development and commercialization costs; competing products currently on the market or in development might reduce the commercial potential of our products; we, our collaborators or others might identify side effects after the product is on the market; or efficacy or safety concerns regarding marketed products, whether or not originating from subsequent testing or other activities by us, governmental regulators, other entities or organizations or otherwise, and whether or not scientifically justified, may lead to product recalls, withdrawals of marketing approval, reformulation of the product, additional pre-clinical testing or clinical trials, changes in labeling of the product, the need for additional marketing applications, declining sales or other adverse events.

We are also subject to risks and uncertainties associated with the actions of our corporate, academic and other collaborators and government regulatory agencies, including risks from market forces and trends; potential product liability; intellectual property, litigation and other dispute resolution, environmental and other risks; the risk that we may not be able to enter into favorable collaboration or other relationships or that existing or future relationships may not proceed as planned; the risk that current and pending patent protection for our products may be invalid, unenforceable or challenged, or fail to provide adequate market exclusivity, or that our rights to in-licensed intellectual property may be terminated for our failure to satisfy performance milestones; the risk of difficulties in, and regulatory compliance relating to, manufacturing products; and the uncertainty of our future profitability.

Risks and uncertainties also include general economic conditions, including interest and currency exchange-rate fluctuations and the availability of capital; changes in accounting principles generally accepted in the United States; the impact of legislation and regulatory compliance; the highly regulated nature of our business, including government cost-containment initiatives and restrictions on third-party payments for our products; trade buying patterns; the competitive climate of our industry; and other factors set forth in this document and other reports filed with the SEC. In particular, we cannot assure you that our current development programs will be commercially successful or be approved in the future in other formulations, indications or jurisdictions, or that any of our other programs will result in a commercial product.

In some cases, you can identify forward-looking statements by terminology such as expect, anticipate, estimate, continue, plan, believe, could, intend, predict, project, potential, may, should, will or the negative similar import regarding our expectations. Forward-looking statements are only predictions and actual events or

results may differ materially. Although we believe that our expectations are based on reasonable assumptions within the bounds of our current knowledge of our industry, business and operations, we cannot guarantee that actual results will not differ materially from our expectations. In evaluating such forward-looking statements, you should specifically consider various factors, including the risks outlined under the heading **Risk Factors** contained in this prospectus and any related free writing prospectus, and in any other

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documents incorporated herein or therein (including in our most recent Annual Report on Form 10-K and Quarterly Report on Form 10-Q). The discussion of risks and uncertainties set forth in those filings is not necessarily a complete or exhaustive list of all risks facing us at any particular point in time. We operate in a highly competitive, highly regulated and rapidly changing environment, and our business is in a state of evolution. Therefore, it is likely that over time new risks will emerge and the nature and elements of existing risks will change. It is not possible for management to predict all such risk factors or changes therein or to assess either the impact of all such risk factors on our business or the extent to which any individual risk factor, combination of factors or new or altered factors may cause results to differ materially from those contained in any forward-looking statement. Forward-looking statements represent our estimates and assumptions only as of the date such forward-looking statements are made. You should carefully read this prospectus and any related free writing prospectus, together with the information incorporated herein or therein by reference, and with the understanding that our actual future results may materially differ from what we expect.

Except as required by law, forward-looking statements speak only as of the date they are made. We do not have a policy of updating or revising forward-looking statements and we assume no obligation to update any statements as a result of new information or future events or developments. It should not be assumed that our silence over time means that actual events are bearing out as expressed or implied in forward-looking statements.

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USE OF PROCEEDS

We estimate that the net proceeds received by us from this offering, based on an assumed offering price of \$19.52 per share, the last reported sale price of our common stock on The NASDAQ Global Select Market on May 15, 2015, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us, will be approximately \$49.9 million, or approximately \$57.5 million, if the underwriters exercise their option to purchase additional shares in full. A \$1.00 increase (decrease) in the assumed public offering price of \$19.52 per share would increase (decrease) the net proceeds from this offering by approximately \$2.6 million, assuming that the number of shares we are offering, as set forth on the cover page of this prospectus, remains the same, after deducting the estimated underwriting discount and estimated offering expenses payable by us. We may also increase or decrease the number of shares we are offering. Each increase (decrease) of 100,000 shares in the number of shares we are offering would increase (decrease) the net proceeds to us from this offering by approximately \$1.8 million, assuming that the assumed public offering price remains the same, and after deducting the estimated underwriting discount and estimated offering expenses payable by us.

We currently intend to use the net proceeds from this offering for preclinical studies and clinical trials, with the remainder of any net proceeds from sales of securities being used for continued technology platform development, working capital and general corporate purposes. We may also use a portion of the net proceeds to acquire or invest in businesses, products or technologies that are complementary to our own. We regularly consider such opportunities but are not currently negotiating any such transactions. The amount and timing of these expenditures will depend on a number of factors, such as the timing, scope, progress and results of our research and development efforts, the timing and progress of any partnership efforts, and the competitive environment for our product candidates.

As of the date of this prospectus supplement, we cannot specify with certainty all of the particular uses for the net proceeds to us from this offering, if any. As a result, our management will have broad discretion regarding the timing and application of the net proceeds from this offering. Pending the application of the net proceeds, we intend to invest the net proceeds in short-term, investment grade, interest-bearing securities.

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If you invest in our common stock, you will experience dilution to the extent of the difference between the price per share you pay in this offering and the net tangible book value per share of our common stock immediately after this offering. Our net tangible book value as of March 31, 2015 was approximately \$86.7 million, or \$4.87 per share of our common stock. Net tangible book value per share as of March 31, 2015 is equal to our total tangible assets minus total liabilities, all divided by the number of shares of common stock outstanding as of March 31, 2015.

After giving effect to the sale of 2,750,000 shares of our common stock in this offering at an assumed offering price of \$19.52 per share, the last reported sale price of our common stock on The NASDAQ Global Select Market on May 15, 2015, and after deducting estimated offering commissions and expenses payable by us, our as adjusted net tangible book value would have been approximately \$136.6 million, or approximately \$6.64 per share of common stock, as of March 31, 2015. This represents an immediate increase in net tangible book value of approximately \$1.77 per share to existing stockholders and an immediate dilution of approximately \$12.88 per share to investors in this offering. The following table illustrates this calculation on a per share basis.

| | |
|--|----------|
| Assumed public offering price per share | \$ 19.52 |
| Net tangible book value per share as of March 31, 2015 | \$ 4.87 |
| Increase in net tangible book value per share after this offering | \$ 1.77 |
| As adjusted net tangible book value per share as of March 31, 2015, after giving effect to this offering | \$ 6.64 |
| Dilution per share to new investors purchasing shares in this offering | \$ 12.88 |

The information in this section assumes that the underwriters do not exercise their option to purchase additional shares. If the underwriters exercise their option to purchase additional shares in full, our pro forma net tangible book value per share at March 31, 2015 after giving effect to this offering would have been \$6.87 per share, and the dilution in pro forma net tangible book value per share to investors in this offering would have been \$12.65 per share.

The table above assumes for illustrative purposes that an aggregate of 2,750,000 shares of our common stock are sold at a price of \$19.52 per share, the last reported sale price of our common stock on The NASDAQ Global Select Market on May 15, 2015, for aggregate gross proceeds of \$53.7 million. We may also increase or decrease the public offering price per share and the number of shares we are offering. An increase of \$1.00 per share in the price at which the shares are sold from the assumed offering price of \$19.52 per share shown in the table above, assuming all of our common stock in the aggregate amount of \$56.4 million is sold at that price, would increase our adjusted net tangible book value per share after the offering to \$6.77 per share and would increase the dilution in net tangible book value per share to new investors in this offering to \$13.75 per share, after deducting commissions and estimated aggregate

offering expenses payable by us. A decrease of \$1.00 per share in the price at which the shares are sold from the assumed offering price of \$19.52 per share shown in the table above, assuming all of our common stock in the aggregate amount of \$50.9 million is sold at that price, would decrease our adjusted net tangible book value per share after the offering to \$6.52 per share and would decrease the dilution in net tangible book value per share to new investors in this offering to \$12.00 per share, after deducting commissions and estimated aggregate offering expenses payable by us. An increase of 100,000 shares in the number of shares we are offering would increase our as adjusted net tangible book value to \$6.70 per share, and decrease the dilution per share to new investors to \$12.82 per share, assuming the assumed public offering price remains the same. A decrease of 100,000 shares in the number of shares we are offering would decrease our as adjusted net tangible book value to \$6.58 per share, and increase the dilution per share to new investors to \$12.94 per share, assuming the assumed public offering price remains the same. This information is supplied for illustrative purposes only and will change based on the actual public offering price, number of shares and other terms of this offering determined at pricing.

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The number of shares of our common stock shown above to be outstanding immediately after this offering is based on 17,822,074 shares outstanding as of March 31, 2015 and excludes as of such date:

- n 87,901 shares of our common stock issuable upon the exercise of outstanding warrants, at a weighted average exercise price of \$13.08 per share;
- n 4,238,198 shares of our common stock issuable upon the exercise of outstanding options, at a weighted average exercise price of \$12.36 per share; and
- n 170,377 shares of our common stock available for future issuance pursuant to our existing stock incentive plans.

The above illustration of dilution per share to investors participating in this offering assumes no exercise of outstanding options to purchase our common stock or outstanding warrants to purchase shares of our common stock. The exercise of outstanding options and warrants having an exercise price per share that is less than the offering price per share in this offering will increase dilution to investors in this offering.

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Table of Contents**UNDERWRITING**

Subject to the terms and conditions set forth in the underwriting agreement, dated _____, 2015, among us and Jefferies LLC and Leerink Partners LLC, as the representatives of the underwriters named below and joint book-running managers of this offering, we have agreed to sell to the underwriters, and each of the underwriters has agreed, severally and not jointly, to purchase from us, the respective number of shares of common stock shown opposite its name below:

| UNDERWRITERS | NUMBER OF SHARES |
|--|-----------------------------|
| Jefferies LLC | |
| Leerink Partners LLC | |
| Cowen and Company, LLC | |
| Stifel, Nicolaus & Company, Incorporated | |
| Total | |

The underwriting agreement provides that the obligations of the several underwriters are subject to certain conditions precedent such as the receipt by the underwriters of officers' certificates and legal opinions and approval of certain legal matters by their counsel. The underwriting agreement provides that the underwriters will purchase all of the shares of common stock if any of them are purchased. If an underwriter defaults, the underwriting agreement provides that the purchase commitments of the nondefaulting underwriters may be increased or the underwriting agreement may be terminated. We have agreed to indemnify the underwriters and certain of their controlling persons against certain liabilities, including liabilities under the Securities Act, and to contribute to payments that the underwriters may be required to make in respect of those liabilities. We have granted to the underwriters an option to purchase additional shares of common stock as described below. See [Option to Purchase Additional Shares](#).

The underwriters have advised us that, following the completion of this offering, they currently intend to make a market in the common stock as permitted by applicable laws and regulations. However, the underwriters are not obligated to do so, and the underwriters may discontinue any market-making activities at any time without notice in their sole discretion. Accordingly, no assurance can be given as to the liquidity of the trading market for the common stock, that you will be able to sell any of the common stock held by you at a particular time or that the prices that you receive when you sell will be favorable.

The underwriters are offering the shares of common stock subject to their acceptance of the shares of common stock from us and subject to prior sale. The underwriters reserve the right to withdraw, cancel or modify offers to the public and to reject orders in whole or in part. In addition, the underwriters have advised us that they do not intend to confirm sales to any account over which they exercise discretionary authority.

Commission and Expenses

The underwriters have advised us that they propose to offer the shares of common stock to the public at the initial public offering price set forth on the cover page of this prospectus supplement and to certain dealers, which may include the underwriters, at that price less a concession not in excess of \$ _____ per share of common stock. The underwriters may allow, and certain dealers may reallow, a discount from the concession not in excess of \$ _____ per share of common stock to certain brokers and dealers. After the offering, the initial public offering price, concession and reallowance to dealers may be reduced by the representatives. No such reduction will change the amount of proceeds to be received by us as set forth on the cover page of this prospectus supplement.

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The following table shows the public offering price, the underwriting discounts and commissions that we are to pay the underwriters and the proceeds, before expenses, to us in connection with this offering. Such amounts are shown assuming both no exercise and full exercise of the underwriters' option to purchase additional shares.

| | PER SHARE | | TOTAL | |
|--|--|---|--|---|
| | WITHOUT OPTION TO PURCHASE ADDITIONAL SHARES | WITH OPTION TO PURCHASE ADDITIONAL SHARES | WITHOUT OPTION TO PURCHASE ADDITIONAL SHARES | WITH OPTION TO PURCHASE ADDITIONAL SHARES |
| Public offering price | \$ | \$ | \$ | \$ |
| Underwriting discounts and commissions paid by us | \$ | \$ | \$ | \$ |
| Proceeds to us, before expenses | \$ | \$ | \$ | \$ |

We estimate expenses payable by us in connection with this offering, other than the underwriting discounts and commissions referred to above, will be approximately \$565,000. We also have agreed to reimburse the underwriters for certain of their expenses in an amount up to \$40,000 as set forth in the underwriting agreement. In accordance with FINRA Rule 5110, this reimbursed expense is deemed underwriting compensation for this offering.

Listing

Our common stock is listed on The NASDAQ Global Select Market under the trading symbol DRNA .

Stamp Taxes

If you purchase shares of common stock offered in this prospectus supplement, you may be required to pay stamp taxes and other charges under the laws and practices of the country of purchase, in addition to the offering price listed on the cover page of this prospectus supplement.

Option to Purchase Additional Shares

We have granted to the underwriters an option, exercisable for 30 days from the date of this prospectus supplement, to purchase, from time to time, in whole or in part, up to an aggregate of 412,500 shares from us at the public offering price set forth on the cover page of this prospectus supplement, less underwriting discounts and commissions. If the underwriters exercise this option, each underwriter will be obligated, subject to specified conditions, to purchase a number of additional shares proportionate to that underwriter's initial purchase commitment as indicated in the table above. This option may be exercised only if the underwriters sell more shares than the total number set forth on the cover page of this prospectus supplement.

No Sales of Similar Securities

We and our executive officers have agreed, subject to specified exceptions, not to directly or indirectly:

- n sell, offer, contract or grant any option to sell (including any short sale), pledge, transfer, establish an open put equivalent position within the meaning of Rule 16a-1(h) under the Securities Exchange Act of 1934, as amended, or
- n otherwise dispose of any shares of common stock, options or warrants to acquire shares of common stock, or securities exchangeable or exercisable for or convertible into shares of common stock currently or hereafter owned either of record or beneficially, or
- n publicly announce an intention to do any of the foregoing for a period of 90 days after the date of this prospectus supplement without the prior written consent of Jefferies LLC and Leerink Partners LLC.

This restriction terminates after the close of trading of the common stock on and including the 90th day after the date of this prospectus supplement.

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Jefferies LLC and Leerink Partners LLC may, in their sole discretion and at any time or from time to time before the termination of the 90-day period release all or any portion of the securities subject to lock-up agreements. There are no existing agreements between the underwriters and any of our stockholders who will execute a lock-up agreement, providing consent to the sale of shares prior to the expiration of the lock-up period.

Stabilization

The underwriters have advised us that, pursuant to Regulation M under the Exchange Act, certain persons participating in the offering may engage in short sale transactions, stabilizing transactions, syndicate covering transactions or the imposition of penalty bids in connection with this offering. These activities may have the effect of stabilizing or maintaining the market price of the common stock at a level above that which might otherwise prevail in the open market. Establishing short sales positions may involve either covered short sales or naked short sales.

Covered short sales are sales made in an amount not greater than the underwriters' option to purchase additional shares of our common stock in this offering. The underwriters may close out any covered short position by either exercising their option to purchase additional shares of our common stock or purchasing shares of our common stock in the open market. In determining the source of shares to close out the covered short position, the underwriters will consider, among other things, the price of shares available for purchase in the open market as compared to the price at which they may purchase shares through the option to purchase additional shares.

Naked short sales are sales in excess of the option to purchase additional shares of our common stock. The underwriters must close out any naked short position by purchasing shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the shares of our common stock in the open market after pricing that could adversely affect investors who purchase in this offering.

A stabilizing bid is a bid for the purchase of shares of common stock on behalf of the underwriters for the purpose of fixing or maintaining the price of the common stock. A syndicate covering transaction is the bid for or the purchase of shares of common stock on behalf of the underwriters to reduce a short position incurred by the underwriters in connection with the offering. Similar to other purchase transactions, the underwriter's purchases to cover the syndicate short sales may have the effect of raising or maintaining the market price of our common stock or preventing or retarding a decline in the market price of our common stock. As a result, the price of our common stock may be higher than the price that might otherwise exist in the open market. A penalty bid is an arrangement permitting the underwriters to reclaim the selling concession otherwise accruing to a syndicate member in connection with the offering if the common stock originally sold by such syndicate member are purchased in a syndicate covering transaction and therefore have not been effectively placed by such syndicate member.

Neither we nor any of the underwriters make any representation or prediction as to the direction or magnitude of any effect that the transactions described above may have on the price of our common stock. The underwriters are not obligated to engage in these activities and, if commenced, any of the activities may be discontinued at any time.

The underwriters may also engage in passive market making transactions in our common stock on The NASDAQ Global Select Market in accordance with Rule 103 of Regulation M during a period before the commencement of offers or sales of shares of our common stock in this offering and extending through the completion of distribution. A passive market maker must display its bid at a price not in excess of the highest independent bid of that security. However, if all independent bids are lowered below the passive market maker's bid, that bid must then be lowered when specified purchase limits are exceeded.

Electronic Distribution

A prospectus in electronic format may be made available by e-mail or on the web sites or through online services maintained by one or more of the underwriters or their affiliates. In those cases, prospective investors may view offering terms online and may be allowed to place orders online. The underwriters may agree with us to allocate a specific number of shares of common stock for sale to online brokerage account holders. Any such allocation for online distributions will be made by the underwriters on the same basis as other allocations. Other than the

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prospectus in electronic format, the information on the underwriters' web sites and any information contained in any other web site maintained by any of the underwriters is not part of this prospectus supplement, has not been approved and/or endorsed by us or the underwriters and should not be relied upon by investors.

Other Activities and Relationships

The underwriters and certain of their affiliates are full service financial institutions engaged in various activities, which may include securities trading, commercial and investment banking, financial advisory, investment management, investment research, principal investment, hedging, financing and brokerage activities. The underwriters and certain of their affiliates have, from time to time, performed, and may in the future perform, various commercial and investment banking and financial advisory services for us and our affiliates, for which they received or will receive customary fees and expenses.

In the ordinary course of their various business activities, the underwriters and certain of their affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for their own account and for the accounts of their customers, and such investment and securities activities may involve securities and/or instruments issued by us and our affiliates. If the underwriters or their respective affiliates have a lending relationship with us, they routinely hedge their credit exposure to us consistent with their customary risk management policies. The underwriters and their respective affiliates may hedge such exposure by entering into transactions which consist of either the purchase of credit default swaps or the creation of short positions in our securities or the securities of our affiliates, including potentially the common stock offered hereby. Any such short positions could adversely affect future trading prices of the common stock offered hereby. The underwriters and certain of their respective affiliates may also communicate independent investment recommendations, market color or trading ideas and/or publish or express independent research views in respect of such securities or instruments and may at any time hold, or recommend to clients that they acquire, long and/or short positions in such securities and instruments.

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NOTICE TO INVESTORS

European Economic Area

In relation to each member state of the European Economic Area which has implemented the Prospectus Directive (Relevant Member State), an offer to the public of any common shares which are the subject of the offering contemplated by this prospectus may not be made in that Relevant Member State except that an offer to the public in that Relevant Member State of any common shares may be made at any time under the following exemptions under the Prospectus Directive, if they have been implemented in that Relevant Member State:

- (a) to any legal entity which is a qualified investor as defined in the Prospectus Directive;
- (b) to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the underwriters or the underwriters nominated by us for any such offer; or
- (c) in any other circumstances falling within Article 3(2) of the Prospectus Directive, provided that no such offer of common shares shall require us or any of the underwriters to publish a prospectus pursuant to Article 3 of the Prospectus Directive or supplement a prospectus pursuant to Article 16 of the Prospectus Directive.

For the purposes of this provision, the expression an offer common shares to the public in relation to the common shares in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and the common shares to be offered so as to enable an investor to decide to purchase or subscribe to the common shares, as the same may be varied in that Relevant Member State by any measure implementing the Prospectus Directive in that Relevant Member State and the expression Prospectus Directive means Directive 2003/71/EC (and amendments thereto, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State), and includes any relevant implementing measure in the Relevant Member State and the expression 2010 PD Amending Directive means Directive 2010/73/EU.

United Kingdom

This prospectus is only being distributed to, and is only directed at, persons in the United Kingdom that are qualified investors within the meaning of Article 2(1)(e) of the Prospectus Directive that are also (i) investment professionals falling within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, as amended (Order) and/or (ii) high net worth entities falling within Article 49(2)(a) to (d) of the Order and other persons to whom it may lawfully be communicated (each such person being referred to as a relevant person).

This prospectus and its contents are confidential and should not be distributed, published or reproduced (in whole or in part) or disclosed by recipients to any other persons in the United Kingdom. Any person in the United Kingdom that is not a relevant person should not act or rely on this document or any of its contents.

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LEGAL MATTERS

Sidley Austin LLP, Palo Alto, California, will provide us with an opinion as to the validity of the shares of common stock offered by this prospectus. This opinion may be conditioned upon and may be subject to assumptions regarding future actions required to be taken by us and any underwriters, dealers or agents in connection with the issuance and sale of the securities. Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, Massachusetts, is counsel for the underwriters in connection with this offering.

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EXPERTS

The consolidated financial statements incorporated in this prospectus by reference from the Company's Annual Report on Form 10-K, have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report, which is incorporated herein by reference. Such financial statements have been so incorporated in reliance upon the report of such firm given upon their authority as experts in accounting and auditing.

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WHERE YOU CAN FIND MORE INFORMATION

This prospectus is part of a registration statement that we filed with the SEC. This prospectus omits some information contained in the registration statement in accordance with SEC rules and regulations. You should review the information and exhibits in the registration statement for further information about us and the securities being offered hereby. Statements in this prospectus concerning any document we filed as an exhibit to the registration statement or that we otherwise filed with the SEC are not intended to be comprehensive and are qualified by reference to the filings. You should review the complete document to evaluate these statements.

We are subject to the information reporting requirements of the Exchange Act. In accordance with the Exchange Act, we file annual, quarterly and current reports, proxy statements and other information with the SEC. Such reports, proxy statements and other information filed by us are available to the public free of charge at www.sec.gov. You may also read and copy any document we file with the SEC at the public reference facilities maintained by the SEC at 100 F Street, N.E., Washington, D.C. 20549. You may obtain information on the operation of the public reference facilities by calling the SEC at 1-800-SEC-0330.

We also make these documents available on our website at www.dicerna.com. Our website and the information contained or connected to our website is not incorporated by reference in this prospectus, and you should not consider it part of this prospectus.

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INCORPORATION OF CERTAIN DOCUMENTS BY REFERENCE

SEC rules permit us to incorporate by reference information in this prospectus. This means that we can disclose important information to you by referring you to another document filed separately with the SEC. The information incorporated by reference is considered to be part of this prospectus, except for information superseded by information contained in this prospectus or in any subsequently filed incorporated document. This prospectus incorporates by reference the documents set forth below that we have previously filed with the SEC (Commission File No. 001-36281), other than information in such documents that is deemed to be furnished and not filed. These documents contain important information about Dicerna and its business and financial condition.

- n Annual Report on Form 10-K for the year ended December 31, 2014 filed on March 12, 2015;
- n our Quarterly Report on Form 10-Q for the quarter ended March 31, 2015, which was filed on May 11, 2015;
- n our Current Reports on Form 8-K filed on April 23, 2015 and May 14, 2015; and
- n our Definitive Proxy Statement on Schedule 14A, filed with the SEC on April 30, 2015, as amended (other than the portions thereof which are furnished and not filed).

All documents filed by us pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act subsequent to the date of this prospectus supplement and prior to the completion of this offering and after the date of the initial registration statement and prior to the effectiveness of the registration statement shall be deemed to be incorporated by reference in this prospectus and to be a part hereof from the date of filing of such documents.

Any statement contained herein or in a document incorporated or deemed to be incorporated by reference in this prospectus shall be deemed to be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus, or in any other subsequently filed document which also is or is deemed to be incorporated by reference in this prospectus, modifies or supersedes such earlier statement. Any statement so modified or superseded shall not be deemed, except as so modified or superseded, to constitute a part of this prospectus.

Documents incorporated by reference are available from us without charge, excluding all exhibits unless specifically incorporated by reference as an exhibit to this prospectus. Prospective investors may obtain documents incorporated by reference in this prospectus by requesting them in writing or by telephone from us at our executive offices at:

Dicerna Pharmaceuticals, Inc.

87 Cambridgepark Drive

Cambridge, MA 02140

(617) 621-8097

Attention: Investor Relations and Corporate Communications

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PROSPECTUS

10,000,000 Shares of Common Stock

\$50,000,000

Preferred Stock

Debt Securities

Warrants

Other Rights

Units

10,687,733 Shares of Common Stock

Offered by Selling Stockholders

From time to time, we may sell up to 10,000,000 shares of Common Stock, as well as Preferred Stock, Debt Securities, Warrants, other Rights or Units, in each case in one or more issuances and at prices and on terms that we will determine at the time of the offering.

In addition, the selling stockholders may from time to time offer and sell up to 10,687,733 shares of Common Stock. The price at which the selling stockholders may sell shares of our Common Stock will be determined by prevailing market prices for shares of our Common Stock or in negotiated transactions. We will not receive any of the proceeds from the sale of our Common Stock by the selling stockholders. We cannot predict when or in what amounts the selling stockholders may sell any of the Common Stock offered by this prospectus or any prospectus supplement.

This prospectus describes the general manner in which those securities may be offered using this prospectus. We will specify in an accompanying prospectus supplement the terms of securities offered and the offering thereof. In the prospectus supplement relating to any sales by selling stockholders, we will, among other things, identify the number

of shares of our Common Stock that each of the selling stockholders will be selling.

Our common stock, currently the only Dicerna security outstanding, is listed on The NASDAQ Global Select Market under the symbol DRNA.

We are an emerging growth company as defined by the Jumpstart Our Business Startups Act of 2012 and, as such, we are subject to reduced public company reporting requirements. Investing in our securities involves a high degree of risk. You should review carefully the risks and uncertainties described under the heading Risk Factors on page 8 of this prospectus and under similar headings in the documents that are incorporated by reference into this prospectus, as well as Special Note Regarding Forward-Looking Statements on page 3 of this prospectus.

The securities covered by this prospectus may be sold directly by us to investors, through agents designated from time to time or through underwriters or dealers at prices and on terms to be determined at the time of offering. We will include in the accompanying prospectus supplement the names of any underwriters or agents and any applicable commissions or discounts; additional information on the methods of sale appears under Plan of Distribution. We will also describe in the prospectus supplement the way(s) in which we expect to use the net proceeds we receive from any sale.

Neither the U.S. Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus or the accompanying prospectus supplement is truthful or complete. Any representation to the contrary is a criminal offense.

This prospectus may not be used to offer or sell any securities unless accompanied by a prospectus supplement.

The date of this prospectus is April 2, 2015.

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You should rely only on the information contained or incorporated by reference in this prospectus and in any applicable supplement to this prospectus. We have not authorized any other person to provide you with different information. If anyone provides you with different or inconsistent information, you should not rely on it. We are not making an offer to sell these securities in any jurisdiction where the offer or sale is not permitted. You should assume that the information appearing in this prospectus, the accompanying prospectus supplement and any free writing prospectus prepared by or on behalf of us is accurate only as of the date on their respective covers. Additionally, any information we have incorporated by reference in this prospectus or in any applicable prospectus supplement is accurate only as of the date of the document incorporated by reference, regardless of the time of delivery of this prospectus, any applicable prospectus supplement or any sale of securities. Our business, financial condition, results of operations and prospects may have changed since that date.

This prospectus and any applicable prospectus supplement contain and incorporate by reference market data, industry statistics and other data that have been obtained or compiled from information made available by third parties. We have not independently verified such data. This prospectus, any applicable prospectus supplement and the information incorporated herein or therein by reference include trademarks, service marks and trade names owned by us or other companies. All trademarks, service marks and trade names included or incorporated by reference in this prospectus, any applicable prospectus supplement or any related free writing prospectus are the property of their respective owners.

When used in this prospectus, the terms Dicerna, we, our and us refer to Dicerna Pharmaceuticals, Inc., a Delaware corporation, and its subsidiaries, unless otherwise specified.

This prospectus, any accompanying prospectus supplement and the information incorporated herein and therein by reference, include trademarks, service marks and trade names owned by us or other companies. All trademarks, service marks and trade names included or incorporated by reference in this prospectus supplement or the accompanying prospectus are the property of their respective owners.

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ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement that Dicerna has filed with the U.S. Securities and Exchange Commission (SEC) using a shelf registration process.

By using a shelf registration statement, we may, from time to time, offer and sell Dicerna securities described in this prospectus with an aggregate total offering price of not more than \$50 million and up to 10,000,000 shares of our common stock, in each case in one or more offerings. In addition, under the shelf registration process, the selling stockholders may from time to time sell up to an aggregate of 10,687,733 shares of our common stock in one or more offerings.

This prospectus describes the general manner in which we or the selling stockholders may offer Dicerna securities by this prospectus. Each time we or the selling stockholders sell securities pursuant to the registration statement we will provide a prospectus supplement (which term includes, as applicable, the at-the-market sales agreement prospectus filed with the registration statement of which this prospectus forms a part) that will contain specific information about the offering and the securities offered and may also add, update or change information contained in this prospectus. If there is any inconsistency between information in this prospectus and the accompanying prospectus supplement, you should rely on the information in the latest supplement and documents incorporated by reference herein. This prospectus may not be used to offer to sell, solicit an offer to buy or consummate a sale of Dicerna securities unless it is accompanied by a prospectus supplement.

This prospectus, together with the accompanying prospectus supplement, contains important information you should know before investing, including important information about Dicerna and the securities being offered. You should carefully read both documents, as well as the additional information contained in the documents described under **Where You Can Find More Information** and **Incorporation of Certain Information by Reference** in both this prospectus and the accompanying prospectus supplement, and in particular the periodic and current reporting documents we file with the SEC. We have not authorized any other person to provide you with different information. If anyone provides you with different or inconsistent information, you should not rely on it. This 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.

You should not assume that the information in this prospectus or any documents we incorporate by reference herein or therein is accurate as of any date other than the date on the front of those documents. Our business, financial condition, results of operations and prospects may have changed since those dates.

WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a registration statement on Form S-3 under the Securities Act of 1933, as amended, with respect to the securities offered by this prospectus and the accompanying prospectus supplement. This prospectus and the accompanying prospectus supplement do not contain all of the information set forth in the registration statement and its exhibits and schedules in accordance with SEC rules and regulations. For further information with respect to Dicerna and the securities being offered hereby, you should read the registration statement, including its exhibits and schedules. Statements contained in this prospectus and the accompanying prospectus supplement, including documents that we have incorporated by reference, as to the contents of any contract or other document referred to are not necessarily complete, and, with respect to any contract or other document filed as an exhibit to the registration statement or any other such document, each such statement is qualified in all respects by reference to the corresponding exhibit. You should review the complete document to evaluate these statements. You may obtain copies of the registration statement and its exhibits via the SEC's EDGAR database or our website, or at the offices of

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the SEC, where they may be examined without charge at the Public Reference Room, at the address listed below, or obtained upon payment of the prescribed fees.

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We file annual, quarterly and current reports, proxy statements and other documents with the SEC under the U.S. Securities Exchange Act of 1934, as amended. The SEC maintains a website that contains reports, proxy and information statements and other information regarding issuers, including Dicerna, that file electronically with the SEC. You may obtain documents that we file with the SEC at www.sec.gov and read and copy them at the SEC's Public Reference Room at 100 F Street NE, Washington, DC 20549 (information on operation of the Public Reference Room is available by calling the SEC at 1-800-SEC-0330).

We also make these documents available on our website at www.dicerna.com. Our website and the information contained or connected to our website is not incorporated by reference in this prospectus or any prospectus supplement, and you should not consider it part of this prospectus or any prospectus supplement.

INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

SEC rules permit us to incorporate by reference information in this prospectus and the accompanying prospectus supplement. This means that we can disclose important information to you by referring you to another document filed separately with the SEC. The information incorporated by reference is considered to be part of this prospectus and the accompanying prospectus supplement, except for information superseded by information contained in this prospectus or the accompanying prospectus supplement itself or in any subsequently filed incorporated document. This prospectus and the accompanying prospectus supplement incorporate by reference the documents set forth below that we have previously filed with the SEC (Commission File No. 001-36281), other than information in such documents that is deemed to be furnished and not filed. These documents contain important information about Dicerna and its business and financial condition.

Annual Report on Form 10-K for the year ended December 31, 2014; and

the description of our common stock contained in our Registration Statement on Form 8/A, dated January 28, 2014, including any amendments or reports filed for the purpose of updating such description.

All documents filed by us pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act subsequent to the date of this prospectus and prior to the completion of this offering and after the date of the initial registration statement and prior to the effectiveness of the registration statement shall be deemed to be incorporated by reference in this prospectus and the accompanying prospectus supplement and to be a part hereof from the date of filing of such documents.

Any statement contained herein or in a document incorporated or deemed to be incorporated by reference in this prospectus or the accompanying prospectus supplement shall be deemed to be modified or superseded for purposes of this prospectus and such supplement to the extent that a statement contained in this prospectus or such supplement, or in any other subsequently filed document which also is or is deemed to be incorporated by reference in this prospectus and such supplement, modifies or supersedes such earlier statement. Any statement so modified or superseded shall not be deemed, except as so modified or superseded, to constitute a part of this prospectus or such supplement.

Documents incorporated by reference are available from us without charge, excluding all exhibits unless specifically incorporated by reference as an exhibit to this prospectus and the accompanying prospectus supplement. Prospective investors may obtain documents incorporated by reference in this prospectus and the accompanying prospectus supplement by requesting them in writing or by telephone from us at our executive offices at:

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Dicerna Pharmaceuticals, Inc.

87 Cambridgepark Drive

Cambridge, MA 02140

(617) 621-8097

Attention: Investor Relations and Corporate Communications

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

Certain statements contained or incorporated by reference in this prospectus, any accompanying prospectus supplement and any related free writing prospectus constitute forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995 and releases issued by the SEC and within the meaning of Section 27A of the Securities Act of 1933, as amended (Securities Act), and Section 21E of the Securities Exchange Act of 1934, as amended (Exchange Act). From time to time, we publish forward-looking statements relating to matters such as anticipated financial performance, business prospects, technological developments, new products, research and development activities and other aspects of our present and future business operations as well as similar matters.

Forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause our or our industry's actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by such forward-looking statements. While it is impossible to identify or predict all such matters, these differences may result from, among other things, the inherent uncertainty of the timing and success of, and expense associated with, research, development, regulatory approval and commercialization of our products and product candidates, including the risks that clinical trials will not commence or proceed as planned; products appearing promising in early trials will not demonstrate efficacy or safety in larger-scale trials; clinical trial data on our products and product candidates will be unfavorable; our products will not receive marketing approval from regulators or, if approved, do not gain sufficient market acceptance to justify development and commercialization costs; competing products currently on the market or in development might reduce the commercial potential of our products; we, our collaborators or others might identify side effects after the product is on the market; or efficacy or safety concerns regarding marketed products, whether or not originating from subsequent testing or other activities by us, governmental regulators, other entities or organizations or otherwise, and whether or not scientifically justified, may lead to product recalls, withdrawals of marketing approval, reformulation of the product, additional pre-clinical testing or clinical trials, changes in labeling of the product, the need for additional marketing applications, declining sales or other adverse events.

We are also subject to risks and uncertainties associated with the actions of our corporate, academic and other collaborators and government regulatory agencies, including risks from market forces and trends; potential product liability; intellectual property, litigation and other dispute resolution, environmental and other risks; the risk that we may not be able to enter into favorable collaboration or other relationships or that existing or future relationships may not proceed as planned; the risk that current and pending patent protection for our products may be invalid, unenforceable or challenged, or fail to provide adequate market exclusivity, or that our rights to in-licensed intellectual property may be terminated for our failure to satisfy performance milestones; the risk of difficulties in, and regulatory compliance relating to, manufacturing products; and the uncertainty of our future profitability.

Risks and uncertainties also include general economic conditions, including interest and currency exchange-rate fluctuations and the availability of capital; changes in accounting principles generally accepted in the United States; the impact of legislation and regulatory compliance; the highly regulated nature of our business, including government cost-containment initiatives and restrictions on third-party payments for our products; trade buying patterns; the competitive climate of our industry; and other factors set forth in this document and other reports filed with the SEC. In particular, we cannot assure you that our current development programs will be commercially successful or be approved in the future in other formulations, indications or jurisdictions, or that any of our other programs will result in a commercial product.

In some cases, you can identify forward-looking statements by terminology such as expect, anticipate, estimate, continue, plan, believe, could, intend, predict, project, potential, may, should, will or the negat

similar import regarding our expectations. Forward-looking statements are only predictions and actual events or results may differ materially. Although we believe that our

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expectations are based on reasonable assumptions within the bounds of our current knowledge of our industry, business and operations, we cannot guarantee that actual results will not differ materially from our expectations. In evaluating such forward-looking statements, you should specifically consider various factors, including the risks outlined under the heading **Risk Factors** contained in this prospectus, any accompanying prospectus supplement and any related free writing prospectus, and in any other documents incorporated herein or therein (including in our most recent Annual Report on Form 10-K). The discussion of risks and uncertainties set forth in those filings is not necessarily a complete or exhaustive list of all risks facing us at any particular point in time. We operate in a highly competitive, highly regulated and rapidly changing environment, and our business is in a state of evolution. Therefore, it is likely that over time new risks will emerge and the nature and elements of existing risks will change. It is not possible for management to predict all such risk factors or changes therein or to assess either the impact of all such risk factors on our business or the extent to which any individual risk factor, combination of factors or new or altered factors may cause results to differ materially from those contained in any forward-looking statement. Forward-looking statements represent our estimates and assumptions only as of the date such forward-looking statements are made. You should carefully read this prospectus, any accompanying prospectus supplement and any related free writing prospectus, together with the information incorporated herein or therein by reference, and with the understanding that our actual future results may materially differ from what we expect.

Except as required by law, forward-looking statements speak only as of the date they are made. We do not have a policy of updating or revising forward-looking statements and we assume no obligation to update any statements as a result of new information or future events or developments. It should not be assumed that our silence over time means that actual events are bearing out as expressed or implied in forward-looking statements.

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ABOUT THE COMPANY

The following highlights information about the registrant and our business contained elsewhere or incorporated by reference in this prospectus. It is not complete and does not contain all of the information that you should consider before investing in any of our securities. You should carefully read this prospectus together with the more detailed information incorporated by reference in this prospectus.

Overview

We are an RNA interference-based biopharmaceutical company focused on the discovery and development of innovative treatments for rare inherited diseases involving the liver and for cancers that are genetically defined. We are using RNA interference (RNAi) technology platform to build a broad pipeline in these therapeutic areas. In both rare diseases and oncology, we are pursuing targets that have historically been difficult to inhibit using conventional approaches, but where we believe connections between targets and the diseases are well understood and documented. We aim to discover, develop and commercialize these novel therapeutics either on our own or in collaboration with pharmaceutical partners. In indications such as rare diseases, in which a small sales force will suffice, we seek to retain substantially all commercial rights in key markets. In oncology and other more prevalent disease areas, we may partner our products while seeking to retain significant portions of the commercial rights. We have partnered two of our oncology development programs with the global pharmaceutical company Kyowa Hakko Kirin Co., Ltd. (KHK). We are eligible to receive royalties on worldwide net sales for these product candidates. In addition, we have an option to co-promote, in the U.S., a therapeutic targeting the KRAS gene for an equal share of the profits from U.S. net sales.

In choosing which development programs to advance, we apply scientific, clinical, and commercial criteria that we believe allow us to best leverage our RNAi platform and maximize value for our company. Our current development programs are as follows.

DCR-PH1 for Primary Hyperoxaluria Type 1 (PH1). We are developing DCR-PH1 for the treatment of PH1 by targeting the gene encoding the liver enzyme glycolate oxidase. PH1 is known to afflict an estimated one to three people per million of population, and may afflict as many as six to eight people per million of population, and causes severe renal disease and early mortality. In pre-clinical studies, we have shown that, by using our RNAi technology to inactivate the gene encoding glycolate oxidase, we can significantly reduce oxalate levels, the key pathology of PH1. We intend to begin clinical trials for DCR-PH1 in mid to late 2015. We expect to announce initial proof-of-concept clinical data in late 2015.

Other rare inherited diseases involving the liver. We are investigating a number of other rare diseases involving genes expressed in the liver. We have selected these diseases and disease target genes based on criteria that include having a strong therapeutic hypothesis, a readily-identified patient population, the availability of predictive biomarkers, high unmet medical need, favorable competitive positioning, and a rapid projected path to approval.

DCR-MYC for MYC-related cancers. We are developing DCR-MYC for the treatment of various cancers by targeting the MYC gene. Multiple lines of genetic evidence implicate MYC in the initiation and progression of tumors, including natural variations in the MYC gene that predispose to certain types of

cancer, and frequent genetic amplification and overexpression of MYC within tumors. In preclinical studies, inhibition of the MYC gene with DCR-MYC has shown strong anti-tumor effects in animal models of human cancers. In the second quarter of 2014, we initiated a multi-center, dose-escalating Phase 1 clinical study of DCR-MYC to assess the safety and tolerability of DCR-MYC in patients with solid tumors, multiple myeloma, or lymphoma who are refractory or unresponsive to standard therapies. In fourth quarter of 2014, we initiated a global Phase 1b/2 clinical trial of DCR-MYC in patients with advanced hepatocellular carcinoma (HCC). We expect to announce initial proof-of-concept data from the first Phase 1 study in mid to late 2015.

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Two product candidates in collaboration with KHK, including one for KRAS-related cancers. We are developing, in collaboration with KHK, a therapeutic targeting the KRAS oncogene, a gene that is frequently mutated in numerous cancers, including non-small cell lung cancer, colorectal cancer and pancreatic cancer. Such mutations are associated with aggressive disease and resistance to current therapies. We are also developing, with KHK, a therapeutic targeting a second cancer-related gene, which we are not identifying at this time. KHK is responsible for all preclinical and clinical development activities, including the selection of patient population and disease indications for clinical trials.

Our drug discovery and development efforts are based on the therapeutic modality of RNAi, a highly potent and specific mechanism for silencing the activity of a targeted gene. In this naturally occurring biological process, double-stranded RNA molecules induce the enzymatic destruction of the messenger RNA (mRNA) of a target gene that contains sequences that are complementary to one strand of the therapeutic double-stranded RNA molecule. Our approach is to design proprietary double-stranded RNA molecules that engage the enzyme Dicer and initiate an RNAi process to silence a specific target gene. We refer to these proprietary molecules generally as Dicer substrate short interfering RNAs (DsiRNAs), or as DsiRNA or DsiRNA-EX molecules, depending on the specific structure.

RNAi therapeutics represent a novel advance in drug development. Historically, the pharmaceutical industry has developed small molecules or antibodies to inhibit the activity of disease-causing proteins. This approach is effective for many diseases; nevertheless, many proteins cannot be inhibited by either small molecules or antibodies. Some proteins lack the binding pockets small molecules require for interaction. Other proteins are solely intracellular and therefore inaccessible to antibody-based therapeutics which are limited to cell surface and extracellular proteins.

The novel advantage of RNAi is that instead of targeting proteins, RNAi goes upstream to silence the genes themselves. In 2006, the Nobel Prize was awarded for the discovery of RNAi. That same year we incorporated with the goal of developing RNAi-based therapeutics for previously undruggable disease target genes. Rather than seeking to inhibit a protein directly, the better approach may be to prevent its creation in the first place.

We believe our approach to RNAi drug development provides the following qualities and advantages compared to other methods of inducing RNAi.

We initiate RNAi through the Dicer enzyme. DsiRNA and DsiRNA-EX molecules are structured to be processed by the enzyme Dicer, the initiation point for RNAi in the human cell cytoplasm. Unlike earlier generation RNAi molecules, which mimic the output product of Dicer processing, DsiRNA and DsiRNA-EX molecules enter the RNAi pathway prior to Dicer processing. This can result in preferential use of the correct strand of a double-stranded RNA molecule, and therefore increase the efficacy of the RNAi mechanism. We believe this benefit increases the potency of our DsiRNA and DsiRNA-EX molecules compared to other RNAi-inducing molecules. In addition, due to processing by the Dicer enzyme, our DsiRNA and DsiRNA-EX molecules have multiple sites for chemical modification and conjugation compared to earlier RNAi technologies. At these sites we can use modifications that enhance the drug-like properties on our molecules. Specifically, we can employ modifications that enhance the pharmacokinetic profile and/or suppress immunostimulatory activity.

Our DsiRNA-EX Conjugates enable subcutaneous delivery to the liver. We have developed a proprietary subcutaneous conjugate-based delivery technology for our DsiRNA-EX molecules that enables delivery to hepatocytes in the liver. This technology involves conjugation of a hepatocyte-targeting ligand to the extended portion of our DsiRNA-EX molecules, and we term the entire construct a DsiRNA-EX

Conjugate. This technology is well-suited to our focus on rare inherited diseases involving the liver and can generally be applied to disease target genes and viral pathogens in the liver. We intend to use DsiRNA-EX Conjugates in all future programs involving targets in the liver.

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Our EnCore lipid nanoparticle technology enables delivery to solid tumors. We have developed our proprietary EnCore lipid nanoparticle (LNP) technology for delivery of DsiRNA and DsiRNA-EX molecules to tumors. The EnCore system is engineered to accumulate in tumors and mediate delivery of DsiRNA and DsiRNA-EX molecules into tumor cells. We have extensive pre-clinical data, in multiple animal models of human tumors, of effective RNAi delivery mediated by the EnCore system. We utilize this delivery system in our DCR-MYC program and intend to utilize it for future programs in oncology.

We believe we have a robust patent portfolio covering our proprietary RNAi platform. As of February 1, 2015, our patent estate included over 20 issued patents and over 70 pending patent applications covering our DsiRNA and DsiRNA-EX payload technologies and our lipid nanoparticle and conjugate delivery technologies.

Our executive management team has extensive experience in the biopharmaceutical industry. In addition, various members of our management team and our board of directors have contributed to the progress of the RNAi field through their substantial involvement in companies such as Alnylam Pharmaceuticals Inc. (Alnylam), Genta Inc., Genzyme Inc., GlaxoSmithKline plc, Pfizer Inc., Sirna Therapeutics Inc. and other companies. Our co-founder and chief executive officer, Douglas M. Fambrough III, Ph.D., was a lead venture capital investor and board member of Sirna Therapeutics, an early RNAi company acquired by Merck & Co., Inc. in 2006 for \$1.1 billion. He played a pivotal role in the restructuring of Ribozyme Pharmaceuticals into Sirna Therapeutics, the management of the company as a member of its Board of Directors, and the execution of its 2006 acquisition by Merck & Co., Inc.

Our Corporate Information

We were incorporated in Delaware in October 2006. Additional information concerning the Company is contained in the documents we file with the SEC, as described above. We maintain our executive offices at 87 Cambridgepark Drive, Cambridge, MA 02140, and our main telephone number is (617) 621-8097. We maintain a website at www.dicerna.com, which contains information about us. The information contained in, or that can be accessed through, our website is not part of, and is not incorporated into, this prospectus and should not be considered part of this prospectus.

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RISK FACTORS

An investment in Dicerna securities is speculative in nature and involves a high degree of risk. You should carefully consider the discussion of the material risks of investing in our securities contained in our filings with the SEC, as well as in any applicable prospectus supplement, in evaluating Dicerna and its business and prospects before you decide to purchase our securities. You should also be aware that this document and other public statements we make may contain statements that do not relate strictly to historical fact, any of which may be forward-looking statements within the meaning of the U.S. Private Securities Litigation Reform Act of 1995, and should take into account the considerations relating to such statements referred to in Part I Item 1A Risk Factors of our Annual Report on Form 10-K for the fiscal year ended December 31, 2014, and other filings we make with the SEC. Any of the risks and uncertainties set forth therein could materially and adversely affect our business, results of operations and financial condition, which in turn could materially and adversely affect the trading price or value of our securities. As a result, you could lose all or part of your investment.

The risks and uncertainties we have described are not the only ones facing our company. Additional risks and uncertainties not presently known to us or that we currently deem immaterial may also affect our business operations.

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USE OF PROCEEDS

Unless otherwise described in a prospectus supplement, we intend to use the net proceeds from the sale of any securities under this prospectus for preclinical studies and clinical trials, with the remainder of any net proceeds from sales of securities being used for continued technology platform development, working capital and general corporate purposes.

We will not receive any proceeds from the sale of shares of our common stock by the selling stockholders.

We may set forth additional information concerning our expected use of net proceeds from sales of securities in a prospectus supplement relating to the specific offering. Pending use of net proceeds as described above, we may invest net proceeds in interest-bearing, investment-grade securities.

An accompanying prospectus supplement may not identify precisely the amounts we plan to spend on each of the uses of proceeds listed above or any other uses of proceeds that we may identify in the prospectus supplement. In addition, the amounts actually expended for each purpose may vary significantly depending upon numerous factors, including:

the costs and results of research, development and product candidate testing, including clinical trials;

costs and results of the regulatory approval process;

costs and structure of potential acquisitions, collaborations or other transactions;

the structure of and changes in our relationships with licensors, licensees and collaborators;

the costs of filing, prosecuting, defending and enforcing patent claims;

manufacturing, marketing and other costs associated with commercialization of products; and

changes in the focus and direction of our research and development programs.

DIVIDEND POLICY

We have never declared or paid any cash dividends on our capital stock and do not anticipate paying any cash dividends in the foreseeable future. Payment of cash dividends, if any, in the future will be at the discretion of our board of directors and will depend on then-existing conditions, including our financial condition, operating results, contractual restrictions, capital requirements, business prospects and other factors our board of directors may deem relevant.

RATIO OF EARNINGS TO FIXED CHARGES

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The following table sets forth, for each of the periods presented, our ratio of earnings to fixed charges and our coverage deficiency. You should read this table in conjunction with the financial statements and notes incorporated by reference in this prospectus.

| (in thousands) | December 31 | | |
|--|--------------------|-------------|-------------|
| | 2014 | 2013 | 2012 |
| Net loss | (\$ 47,939) | (\$ 18,518) | (\$ 10,121) |
| Ratio of earnings to fixed charges (1) | N/A | N/A | N/A |
| Coverage deficiency | (\$ 47,939) | (\$ 18,518) | (\$ 10,121) |

- (1) We did not record earnings for the years ended December 31, 2014, 2013 and 2012. Accordingly, our earnings were insufficient to cover fixed charges for such periods and we are unable to disclose a ratio of earnings to fixed charges.

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GENERAL DESCRIPTION OF SECURITIES

We may offer shares of common or preferred stock, various series of debt securities, warrants or other rights to purchase securities, or units consisting of combinations of the foregoing, and the selling stockholders may offer up to 10,687,733 shares of our common stock, in each case from time to time under this prospectus, together with any applicable prospectus supplement, at prices and on terms to be determined by market conditions at the time of offering. This prospectus provides you with a general description of the securities we or the selling stockholders may offer. At the time we or the selling stockholders offer a type or series of securities, we will provide a prospectus supplement describing the specific amounts, prices and other important terms of the securities, including, to the extent applicable:

designation or classification;

aggregate principal amount or aggregate offering price;

voting or other rights;

rates and times of payment of interest, dividends or other payments;

original issue discount;

maturity;

ranking;

restrictive covenants;

redemption, conversion, exercise, exchange, settlement or sinking fund terms, including prices or rates, and any provisions for changes to or adjustments in such prices or rates and in the securities or other property receivable upon conversion, exercise, exchange or settlement;

any securities exchange or market listing arrangements; and

important U.S. federal income tax considerations.

This prospectus may not be used to offer or sell securities unless accompanied by a prospectus supplement. The prospectus supplement may add, update or change information contained in this prospectus or in documents

incorporated by reference in this prospectus. We urge you to read the prospectus supplement related to any securities being offered.

We may sell the securities directly to or through underwriters, dealers or agents. We and our underwriters, dealers or agents reserve the right to accept or reject all or part of any proposed purchase of securities. If we do offer securities through underwriters or agents, we will include in the applicable prospectus supplement (i) the names of the underwriters or agents and applicable fees, discounts and commissions to be paid to them; (ii) details regarding over-allotment options, if any; and (iii) net proceeds to us.

The following descriptions are not complete and may not contain all the information you should consider before investing in any securities we may offer hereunder; they are summarized from, and qualified by reference to, Dicerna's amended and restated certificate of incorporation, bylaws and the other documents referred to in the descriptions, all of which are or will be publicly filed with the SEC, as applicable. See [Where You Can Find More Information](#).

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DESCRIPTION OF CAPITAL STOCK

Our authorized capital stock consists of 150 million shares of common stock, par value \$0.0001 per share, and 5 million shares of preferred stock, par value \$0.0001 per share. As of March 11, 2015, there were 17,820,985 shares of common stock outstanding, none held in treasury, 87,901 subject to outstanding warrants to purchase common stock (including outstanding warrants to purchase preferred stock that became exercisable for shares of common stock upon the closing of our initial public offering), and 4,214,787 reserved for issuance upon exercise of outstanding stock options granted under Company incentive plans, and 170,377 available for future issuance pursuant to our existing stock incentive plans. No shares of preferred stock are issued and outstanding.

Common Stock. Holders of our common stock are entitled to one vote for each share of common stock held of record for the election of directors and on all matters submitted to a vote of stockholders. In the election of directors, a plurality of the votes cast at a meeting of stockholders is sufficient to elect a director. Our stockholders do not have cumulative voting rights in the election of directors. Accordingly, holders of a majority of the voting shares are able to elect all of the directors. In all other matters, except as noted below under **Anti-takeover effects of Delaware law**, our certificate of incorporation and our bylaws, a majority vote of common stockholders is generally required to take action under our certificate of incorporation and bylaws. Holders of our common stock are entitled to receive dividends ratably, if any, as may be declared by our board of directors out of legally available funds, subject to any preferential dividend rights of any preferred stock then outstanding. Upon our dissolution, liquidation or winding up, holders of our common stock are entitled to share ratably in our net assets legally available after the payment of all our debts and other liabilities, subject to the preferential rights of any preferred stock then outstanding. Holders of our common stock have no preemptive, subscription or conversion rights, and there are no redemption or sinking fund provisions applicable to our common stock. The rights, preferences and privileges of holders of common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future. All outstanding shares of common stock are fully paid and non-assessable. American Stock Transfer and Trust Company, LLC is the transfer agent and registrar for our common stock.

Preferred Stock. Our board of directors has the authority, without further vote or action by the stockholders, to designate and issue shares of preferred stock in one or more series and to designate the rights, preferences and privileges of each series, which may be greater than the rights of the common stock. We will fix in a certificate of designation the number of shares, the designation and the rights, preferences and powers, including any dividend, conversion, voting or preemptive rights, terms of redemption or repurchase, liquidation preferences and sinking fund terms, auction and remarketing procedures, and any transfer or other restrictions or limitations of or relating to any series of preferred stock that we sell under this prospectus and applicable prospectus supplements. The Delaware General Corporation Law (DGCL) provides that in addition to any voting rights that may be provided in the applicable certificate of designation, preferred stock holders have the right to vote separately as a class on a proposed amendment to our charter involving certain fundamental changes in their rights. Preferred stock terms could adversely affect the voting power or other rights of common stock holders and the likelihood that they would receive dividend or liquidation payments, and could have the effect of delaying, deferring or preventing a change in control. You should read the prospectus supplement and the certificate of designation relating to any series of preferred stock we may offer.

Outstanding Warrants. As of March 11, 2015, we had outstanding warrants as follows:

five warrants to purchase an aggregate of 2,198 shares of our common stock with an exercise price of \$250 per share, each exercisable at any time on or before June 17, 2020; and

seven warrants to purchase an aggregate of 85,703 shares of our common stock with an exercise price of \$7.00, each exercisable at any time on or before June 26, 2018.

Registration Rights

We are party to an amended and restated registration rights agreement dated as of July 30, 2013, pursuant to which certain of our stockholders are entitled to demand, Form S-3 and piggyback registration rights.

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Demand registration rights

The holders of at least a majority of the registrable securities have the right to demand us to file, for no more than two times, a registration statement on Form S-1 to register all or a portion of their registrable securities.

Form S-3 registration rights

The holders of at least 25 percent of the registrable securities have the right to demand us to file an unlimited number of registration statements on Form S-3 provided that the anticipated aggregate offering price of the registrable securities to be sold under the registration statement on Form S-3 exceeds \$3.0 million, net of underwriting discounts and commissions.

Piggyback registration rights

If we propose to register any of our securities under the Securities Act of 1933, as amended, for sale to the public other than certain exceptions, the holders of registrable securities are entitled to receive notice of such registration and to request that we include their registrable securities for resale in the registration statement. The underwriters of the offering will have the right to limit the number of shares to be included in such registration.

Expenses of registration; indemnification

We are generally required to bear all registration expenses incurred in connection with the demand, Form S-3 and piggyback registrations described above, other than underwriting commissions and discounts. The amended and restated registration rights agreement contain customary indemnification provisions with respect to registration rights.

Termination of registration rights

The demand, Form S-3 and piggyback registration rights described above will terminate five years after the closing of our initial public offering. In addition, the registration rights of a holder of registrable securities will expire if all of the holder's registrable securities may be sold in a three-month period under Rule 144 of the Securities Act of 1933, as amended.

Anti-Takeover Effects of Provisions of Delaware Law and Our Charter Documents

Our certificate of incorporation and bylaws include a number of provisions that may have the effect of encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Removal of directors

Our certificate of incorporation and bylaws provide that subject to any limitations imposed by law and the rights of the holders of any series of our preferred stock, the board of directors or any individual director may be removed from office at any time without cause by the affirmative vote of the holders of a majority of the voting power of all the then-outstanding shares of voting stock of the Company, entitled to vote at an election of directors.

No written consent of stockholders

Our bylaws provide that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting.

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Meetings of stockholders

Our bylaws provide that special meetings of stockholders, which the Company is not obligated to call more than once per calendar year, may only be called by the chairman of our board of directors, our chief executive officer, our board of directors pursuant to a resolution adopted by a majority of the total number of authorized directors, or, subject to certain conditions, by our secretary at the request of the stockholders holding of record, in the aggregate, shares entitled to cast not less than ten percent of the votes at a meeting of the stockholders (assuming all shares entitled to vote at such meeting were present and voted). In addition, our bylaws limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance notice requirements

Our bylaws establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than the close of business on the ninetieth (90th) day nor earlier than the close of business on the one hundred twentieth (120th) day prior to the first anniversary of the annual meeting for the preceding year. The notice must contain certain information specified in the bylaws. These provisions may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed. These provisions may also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of our company.

Amendment to certificate of incorporation and bylaws

Our certificate of incorporation provide that the affirmative votes of the holders of at least a majority of the voting power of all of the the-outstanding shares of our voting stock will be required to amend certain provisions of our certificate of incorporation, including provisions relating to the size of our board of directors, removal of directors, special meeting of stockholders and actions by written consent. The affirmative votes of the holders of at least a majority of the voting power of all of the then-outstanding shares of our voting stock will be required to amend or repeal our bylaws. In addition, our bylaws may be amended by our board of directors, subject to any limitations set forth in the bylaws.

Blank check preferred stock

Our certificate of incorporation provides for 5,000,000 authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to render more difficult or to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of us or our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Delaware Law

We are subject to the provisions of Section 203 of the DGCL, which, subject to certain exceptions, prohibits a publicly-held Delaware corporation from engaging in a business combination with an interested

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stockholder for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the interested stockholder attained such status with the approval of the board of directors or the business combination is approved in a prescribed manner. A business combination includes a merger or asset sale involving or other transaction resulting in a financial benefit to the interested stockholder. Subject to various exceptions, an interested stockholder is a person who, together with affiliates and associates, owns, or within the past three years did own, 15% or more of a corporation's voting stock. This statute could prohibit or delay the accomplishment of mergers or other takeover or change in control attempts and, accordingly, may discourage attempts to acquire the Company.

Delaware as sole and exclusive forum

Our bylaws provide, that unless we consent in writing to an alternative forum, the Court of Chancery of the State of Delaware shall, to the fullest extent permitted by law, be the sole and exclusive forum for (i) any derivative action or proceeding brought on behalf of us, (ii) any action asserting a claim of breach of a fiduciary duty owed by, or otherwise wrongdoing by, any of our directors, officers or other employees to us or our stockholders, (iii) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law, as amended, or our certificate of incorporation or bylaws, (iv) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws, or (v) any action asserting a claim against us or any of our directors, officers or employees governed by the internal affairs doctrine.

Charter Documents

Our bylaws provide that we will indemnify our directors and executive officers to the fullest extent permitted by Delaware law and that we may indemnify our other officers, employees and other agents. We may enter into indemnification contracts with our directors and officers and purchase insurance on behalf of any person whom we are required or permitted to indemnify. In addition, our charter provides that the liability of our directors for monetary damages shall be eliminated, except for (i) breach of the directors duty of loyalty to the Company or its stockholders, (ii) acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) violating Section 174 of the DGCL, or (iv) any transaction from which the director derived an improper personal benefit. Pursuant to Delaware law and subject to the foregoing exceptions, our directors shall not be liable for monetary damages for breach of the directors' fiduciary duty of care to the Company and its stockholders. This provision does not eliminate the duty of care: in appropriate circumstances, equitable remedies such as injunctive or other forms of non-monetary relief remain available under Delaware law, and it does not affect a director's responsibilities under any other law, such as U.S. federal securities laws or state or federal environmental or other laws.

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DESCRIPTION OF DEBT SECURITIES

We may issue debt securities from time to time, in one or more series, as senior, subordinated or junior subordinated, convertible or non-convertible and secured or unsecured debt. Any senior debt securities will rank equally with any unsubordinated debt. Subordinated debt securities will rank equally with any other subordinated debt of the same ranking we may issue. Convertible debt securities will be convertible into or exchangeable for our common stock or other securities at predetermined conversion rates, and conversion may be mandatory or at the holder's option.

Debt securities will be issued under one or more indentures—contracts between us and a national banking association or other eligible party acting as trustee. Following is a summary of certain general features of debt securities we may issue; we will describe the particular terms of any debt securities that we may offer in more detail in the applicable prospectus supplement, which may differ from the terms we describe below. You should read the prospectus supplements, any free writing prospectus we may authorize and the indentures, supplemental indentures and forms of debt securities relating to any series of debt securities we may offer.

General. Except as we may otherwise provide in a prospectus supplement, the relevant indenture will provide that debt securities may be issued from time to time in one or more series. The indenture will not limit the amount of debt securities that may be issued thereunder, and will provide that the specific terms of any series of debt securities shall be set forth in, or determined pursuant to, an authorizing resolution, an officer's certificate or a supplemental indenture, if any, relating to such series.

We will describe in each prospectus supplement the following terms relating to any series of debt securities:

the title or designation;

whether they will be secured or unsecured, and the terms of any security;

whether the debt securities will be subject to subordination, and any terms thereof;

any limit upon the aggregate principal amount;

the date or dates on which the debt securities may be issued and on which we will pay the principal;

the interest rate, which may be fixed or variable, or the method for determining the rate, the date interest will begin to accrue, the date or dates interest will be payable and the record dates for interest payment dates or the method for determining them;

the manner in which the amounts of payment of principal of, premium or interest on the debt securities will be determined, if these amounts may be determined by reference to an index based on a currency or currencies other than that in which the debt securities are denominated or designated to be payable or by

reference to a commodity, commodity index, stock exchange index or financial index;

the currency of denomination;

if payments of principal of, premium or interest will be made in one or more currencies or currency units other than that or those in which the debt securities are denominated, the manner in which the exchange rate with respect to these payments will be determined;

the place or places where the principal of, premium, and interest will be payable, where debt securities of any series may be presented for registration of transfer, exchange or conversion, and where notices and demands to or upon the Company in respect of the debt securities may be made;

the form of consideration in which principal of, premium or interest will be paid;

the terms and conditions upon which we may redeem the debt securities;

any obligation we have to redeem or purchase the debt securities pursuant to any sinking fund, amortization or analogous provisions or at the option of a holder;

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the dates on which and the price or prices at which we will repurchase the debt securities at the option of holders and other detailed terms and provisions of these obligations;

the denominations in which the debt securities will be issued, if other than denominations of \$1,000 and any integral multiple thereof;

the portion of principal amount payable upon declaration of acceleration of the maturity date, if other than the principal amount;

whether the debt securities are to be issued at any original issuance discount and the amount of discount with which they may be issued;

whether the debt securities will be issued in certificated or global form and, in such case, the depository and the terms and conditions, if any, upon which interests in such global security or securities may be exchanged in whole or in part for the individual securities represented thereby;

provisions, if any, for defeasance in whole or in part and any addition or change to provisions related to satisfaction and discharge;

the form of the debt securities;

the terms and conditions upon which convertible debt securities will be convertible or exchangeable into securities or property of the Company or another person, if at all, and any additions or changes, if any, to permit or facilitate the same;

provisions, if any, granting special rights to holders upon the occurrence of specified events;

any restriction or condition on transferability;

any addition or change in the provisions related to compensation and reimbursement of the trustee;

any addition to or change in the events of default described in this prospectus or in the indenture and any change in the acceleration provisions so described;

whether the debt securities will restrict our ability to pay dividends, or will require us to maintain any asset ratios or reserves;

whether we will be restricted from incurring any additional indebtedness;

any addition to or change in the covenants described in this prospectus or in the indenture, including terms of any restrictive covenants; and

any other terms which may modify or delete any provision of the indenture.

We may issue debt securities that provide for an amount less than their stated principal amount to be due and payable upon declaration of acceleration of their maturity pursuant to the terms of the indenture. We will provide you with information on the U.S. federal income tax considerations and other special considerations applicable to any debt securities in the applicable prospectus supplement.

Conversion or Exchange Rights. We will set forth in the prospectus supplement the terms, if any, on which a series of debt securities may be convertible into or exchangeable for our common stock or other securities. We will include provisions as to whether conversion or exchange is mandatory, at the option of the holder or at our option. We may include provisions pursuant to which the number of shares of our common stock or other securities that the holders of debt securities receive would be subject to adjustment.

Consolidation, Merger or Sale; No Protection in Event of a Change of Control or Highly Leveraged Transaction. Except as we may otherwise provide in a prospectus supplement, the indenture will provide that we may not merge or consolidate with or into another entity, or sell other than for cash or lease all or substantially all our assets to another entity, or purchase all or substantially all the assets of another entity unless we are the surviving entity or, if we are not the surviving entity, the successor, transferee or lessee entity expressly assumes all of our obligations under the indenture or the debt securities, as appropriate.

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Unless we state otherwise in the applicable prospectus supplement, the debt securities will not contain any provisions that may afford holders additional protection in the event we have a change of control or in the event of a highly leveraged transaction (whether or not such transaction results in a change of control), which could adversely affect them.

Events of Default Under the Indenture. Except as we may otherwise provide in a prospectus supplement, the following will be events of default under the indenture with respect to any series of debt securities that we may issue:

if we fail to pay interest when due and our failure continues for 90 days and the time for payment has not been extended or deferred;

if we fail to pay the principal, or premium, if any, when due whether by maturity or called for redemption;

if we fail to pay a sinking fund installment, if any, when due and our failure continues for 30 days;

if we fail to observe or perform any other covenant relating to the debt securities, other than a covenant specifically relating to and for the benefit of holders of another series of debt securities, and our failure continues for 90 days after we receive written notice from the debenture trustee or holders of not less than a majority in aggregate principal amount of the outstanding series; and

if specified events of bankruptcy, insolvency or reorganization occur as to the Company.

No event of default with respect to a particular series of debt securities (except as to certain events of bankruptcy, insolvency or reorganization) will necessarily constitute an event of default with respect to any other series. The occurrence of an event of default may constitute an event of default under any bank credit agreements we may have in existence from time to time. In addition, the occurrence of certain events of default or an acceleration under the indenture may constitute an event of default under certain of our other indebtedness outstanding from time to time.

Except as we may otherwise provide in a prospectus supplement, if an event of default with respect to debt securities of any series at the time outstanding occurs and is continuing, then the trustee or the holders of not less than a majority in principal amount of the outstanding series may, by a notice in writing to us (and to the debenture trustee if given by the holders), declare to be due and payable immediately the principal (or, if the debt securities are discount securities, that portion of the principal amount as may be specified in the terms of such securities) of and premium and accrued and unpaid interest, if any, on all such debt securities. Before a judgment or decree for payment of the money due has been obtained with respect to any series, the holders of a majority in principal amount of that series (or, at a meeting of holders at which a quorum is present, the holders of a majority in principal amount represented at such meeting) may rescind and annul the acceleration if all events of default, other than the non-payment of accelerated principal, premium, if any, and interest, if any, have been cured or waived as provided in the applicable indenture (including payments or deposits in respect of principal, premium or interest that had become due other than as a result of such acceleration) and the Company has deposited with the indenture trustee or paying agent a sum sufficient to pay all amounts owed to the indenture trustee under the indenture, all arrears of interest, if any, and the principal and premium, if any, on the debt securities that have become due other than by such acceleration. We refer you to the relevant prospectus supplement relating to any discount securities for the particular provisions relating to acceleration

of a portion of the principal amount thereof upon the occurrence of an event of default.

Subject to the terms of the indenture, and except as we may otherwise provide in a prospectus supplement, if an event of default under the indenture shall occur and be continuing, the debenture trustee will be under no obligation to exercise any of its rights or powers under such indenture at the request or direction of any of the holders of the applicable series, unless such holders have offered the debenture trustee reasonable indemnity. The holders of a majority in principal amount of any series will have the right to direct the time, method and place of conducting any proceeding for any remedy available to the debenture trustee, or exercising any trust or power

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conferred on the debenture trustee, with respect to that series, provided that, subject to the terms of the indenture, the debenture trustee need not take any action that it believes, upon the advice of counsel, might involve it in personal liability or might be unduly prejudicial to holders not involved in the proceeding.

Except as we may otherwise provide in a prospectus supplement, a holder of the debt securities of any series will only have the right to institute a proceeding under the indenture or to appoint a receiver or trustee, or to seek other remedies if:

the holder previously has given written notice to the debenture trustee of a continuing event of default with respect to that series;

the holders of at least a majority in aggregate principal amount outstanding of that series have made written request, and such holders have offered reasonable indemnity to the debenture trustee to institute the proceeding as trustee; and

the debenture trustee does not institute the proceeding, and does not receive from the holders of a majority in aggregate principal amount outstanding of that series (or at a meeting of holders at which a quorum is present, the holders of a majority in principal amount of such series represented at such meeting) other conflicting directions within 60 days after the notice, request and offer.

Except as we may otherwise provide in a prospectus supplement, these limitations will not apply to a suit instituted by a holder of debt securities if we default in the payment of the principal, premium, if any, or interest on, them.

We will periodically file statements with the applicable debenture trustee regarding our compliance with specified covenants in the applicable indenture.

Modification of Indenture; Waiver. Except as we may otherwise provide in a prospectus supplement, the debenture trustee and the Company may, without the consent of any holders, execute a supplemental indenture to change the applicable indenture with respect to specific matters, including, among other things:

to surrender any right or power conferred upon the Company;

to provide, change or eliminate any restrictions on payment of principal of or premium, if any; provided that any such action shall not adversely affect the interests of the holders of debt securities of any series in any material respect;

to change or eliminate any of the provisions of the indenture; provided that any such change or elimination shall become effective only when there is no outstanding debt security created prior to the execution of such supplemental indenture that is entitled to the benefit of such provision and as to which such supplemental indenture would apply;

to evidence the succession of another entity to the Company;

to evidence and provide for the acceptance of appointment by a successor trustee with respect to one or more series of debt securities and to add or change provisions of the indenture to facilitate the administration of the trusts thereunder by more than one trustee;

to cure any ambiguity, mistake, manifest error, omission, defect or inconsistency in the indenture or to conform the text of any provision in the indenture or in any supplemental indenture to any description thereof in the applicable section of a prospectus, prospectus supplement or other offering document that was intended to be a verbatim recitation of a provision of the indenture or of any supplemental indenture;

to add to or change or eliminate any provision of the indenture as shall be necessary or desirable in accordance with any amendments to the U.S. Trust Indenture Act of 1939;

to make any change in any series of debt securities that does not adversely affect in any material respect the interests of the holders thereof; and

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to supplement any of the provisions of the indenture to such extent as shall be necessary to permit or facilitate the defeasance and discharge of any series of debt securities; provided that any such action shall not adversely affect the interests of holders of any debt securities.

In addition, and except as we may otherwise provide in a prospectus supplement, under the indenture the rights of holders of a series of debt securities may be changed by us and the debenture trustee with the written consent of the holders of at least a majority in aggregate principal amount outstanding (or, at a meeting of holders of such series at which a quorum is present, the holders of a majority in principal amount represented at such meeting) that is affected. The debenture trustee and the Company may, however, make the following changes only with the consent of each holder of any outstanding debt securities affected:

extending the fixed maturity;

reducing the principal amount, reducing the rate of or extending the time of payment of interest, or any premium payable upon redemption;

reducing the principal amount of discount securities payable upon acceleration of maturity;

making the principal of or premium or interest payable in currency other than that stated;

impairing the right to institute suit for the enforcement of any payment on or after the fixed maturity date;

materially adversely affecting the economic terms of any right to convert or exchange; and

reducing the percentage of debt securities, the holders of which are required to consent to any amendment or waiver; or modifying, without the written consent of the trustee, the rights, duties or immunities of the trustee.

Except for certain specified provisions, and except as we may otherwise provide in a prospectus supplement, the holders of at least a majority in principal amount of any series (or, at a meeting of holders of such series at which a quorum is present, the holders of a majority in principal amount represented at such meeting) may, on behalf of the holders of all debt securities of that series, waive our compliance with provisions of the indenture. The holders of a majority in principal amount of the outstanding debt securities of any series may, on behalf of all such holders, waive any past default under the indenture with respect to that series and its consequences, other than a default in the payment of the principal of, premium or any interest; provided, however, that the holders of a majority in principal amount of the outstanding debt securities of any series may rescind an acceleration and its consequences, including any related payment default that resulted from the acceleration.

Discharge. Except as we may otherwise provide in a prospectus supplement, the indenture will provide that we can elect to be discharged from our obligations with respect to one or more series of debt securities. In order to exercise our rights to be discharged, we must deposit with the trustee money or government obligations sufficient to pay all the principal of, the premium, if any, and interest on, the debt securities of the affected series on the dates payments are

due.

Form, Exchange and Transfer. Except as we may otherwise provide in a prospectus supplement, we will issue debt securities only in fully registered form without coupons and, unless we otherwise specify in the applicable prospectus supplement, in denominations of \$1,000 and any integral multiple thereof. Except as we may otherwise provide in a prospectus supplement, the indenture will provide that we may issue debt securities in temporary or permanent global form and as book-entry securities that will be deposited with a depository named by us and identified in a prospectus supplement with respect to that series.

At the option of the holder, subject to the terms of the indenture and the limitations applicable to global securities described in the applicable prospectus supplement, the holder will be able to exchange the debt securities for other debt securities of the same series, in any authorized denomination and of like tenor and aggregate principal amount.

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Subject to the terms of the indenture and the limitations applicable to global securities set forth in the applicable prospectus supplement, holders may present the debt securities for exchange or for registration of transfer, duly endorsed or with the form of transfer endorsed thereon duly executed if so required by us or the security registrar, at the office of the security registrar or at the office of any transfer agent designated by us for this purpose. Unless otherwise provided in the debt securities or the indenture, we will make no service charge for any registration of transfer or exchange, but we may require payment of any taxes or other governmental charges.

We will name in the applicable prospectus supplement the security registrar, and any transfer agent in addition to the security registrar, that we initially designate for any debt securities. We may at any time designate additional transfer agents or rescind the designation of any transfer agent or approve a change in the office through which any transfer agent acts, except that we will be required to maintain a transfer agent in each place of payment for the debt securities of each series.

Except as we may otherwise provide in a prospectus supplement, if we elect to redeem the debt securities of any series, we will not be required to:

issue, register the transfer of, or exchange any debt securities of that series during a period beginning at the opening of business 15 days before the day of mailing of a notice of redemption of any debt securities that may be selected for redemption and ending at the close of business on the day of the mailing; or

register the transfer of or exchange any debt securities so selected for redemption, in whole or in part, except the unredeemed portion of any debt securities we are redeeming in part.

Information Concerning the Debenture Trustee. The debenture trustee, other than during the occurrence and continuance of an event of default under the indenture, will undertake to perform only those duties as are specifically set forth in the indenture. Upon an event of default, the debenture trustee must use the same degree of care as a prudent person would exercise or use in the conduct of his or her own affairs. Subject to this provision, the debenture trustee will be under no obligation to exercise any of the powers given it by the indenture at the request of any holder unless it is offered reasonable security and indemnity against the costs, expenses and liabilities that it might incur.

Payment and Paying Agents. Unless we otherwise indicate in the applicable prospectus supplement, we will make payment of interest on any interest payment date to the person in whose name the debt securities, or one or more predecessor securities, are registered at the close of business on the regular record date for the interest.

Unless we otherwise indicate in the applicable prospectus supplement, we will pay principal of and any premium and interest at the office of the indenture trustee or, at the option of the Company, by check payable to the holder. Unless we otherwise indicate in a prospectus supplement, we will designate the corporate trust office of the debenture trustee our sole paying agent for payments. We will name in the applicable prospectus supplement any other paying agents that we initially designate. We will maintain a paying agent in each place of payment.

All money we pay to a paying agent or the debenture trustee for the payment of principal or any premium or interest which remains unclaimed at the end of two years after such principal, premium or interest has become due and payable will be repaid to us, and the holder of the security thereafter may look only to us for payment thereof.

Governing Law. The indenture and the debt securities will be governed and construed in accordance with the laws of the State of New York.

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No Personal Liability of Directors, Officers, Employees and Stockholders. No incorporator, stockholder, employee, agent, officer, director or subsidiary of ours will have any liability for any obligations of ours or, due to the creation of any indebtedness under the debt securities, the indentures or supplemental indentures. The indentures provide that all such liability is expressly waived and released as a condition of, and as consideration for, the execution of such indentures and the issuance of the debt securities.

DESCRIPTION OF WARRANTS, OTHER RIGHTS AND UNITS

We may from time to time issue warrants or other rights (together, Rights), in one or more series, for the purchase of common stock or preferred stock. We may issue Rights independently or together with such securities, and such Rights may be attached to or separate from them. Rights will be evidenced by a Rights certificate issued under one or more Rights agreements between us and a Rights agent which will act solely as our agent in connection with the Rights and will not have any obligation or relationship of agency or trust for or with any holders or beneficial owners of Rights. We may issue securities in units, each consisting of two or more types of securities. For example, we might issue units consisting of a combination of common stock and warrants to purchase common stock. If we issue units, the prospectus supplement relating to the units will contain the information described above with regard to each of the securities that is a component of the units. In addition, the prospectus supplement relating to the units will describe the terms of any units we issue. The forms of any such certificates and agreements will be filed as exhibits to the registration statement of which this prospectus is a part by amendment thereof or as exhibits to a Current Report on Form 8-K incorporated herein by reference, and the accompanying prospectus supplement and such forms may add, update or change the terms and conditions of the Rights or Units described in this prospectus. You should read the prospectus supplements, Rights agreements and Rights certificates that contain the terms of the Rights in their entirety.

The particular terms of each issue of Rights or Units will be described in the applicable prospectus supplement, including, as applicable:

the title of the Rights or Units;

any initial offering price;

the title, aggregate principal amount or number and terms of the securities purchasable upon exercise of the Rights;

the principal amount or number of securities purchasable upon exercise of each Right and the price at which that principal amount or number may be purchased upon exercise of each Right;

the currency or currency units in which any offering price and any exercise price are payable;

the title and terms of any related securities with which the Rights are issued and the number of the Rights issued with each security;

any date on and after which the Rights or Units and the related securities will be separately transferable;

any minimum or maximum number of Rights that may be exercised at any one time;

the date on which the right to exercise the Rights will commence and the date on which the right will expire;

a discussion of U.S. federal income tax, accounting or other considerations applicable to the Rights or Units;

whether the Rights represented by the Rights certificates, if applicable, will be issued in registered or bearer form and, if registered, where they may be transferred and registered;

any anti-dilution provisions of the Rights or Units;

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any redemption or call provisions applicable to the Rights;

any provisions for changes to or adjustments in the exercise price of any Rights; and

any additional terms of the Rights or Units, including terms, procedures and limitations relating to exchange and exercise of the Rights or Units.

Rights certificates will be exchangeable for new Rights certificates of different denominations and, if in registered form, may be presented for registration of transfer, and Rights may be exercised, at the corporate trust office of the Rights agent or any other office indicated in the related prospectus supplement. Before the exercise of Rights, holders of Rights will not be entitled to payments of any dividends, principal, premium or interest on securities purchasable upon exercise of the Rights, to vote, consent or receive any notice as a holder of and in respect of any such securities or to enforce any covenants in any indenture, or to exercise any other rights whatsoever as a holder of securities purchasable upon exercise of the Rights.

PLAN OF DISTRIBUTION FOR SECURITIES OFFERED BY US

We may sell the offered securities in and outside the United States (1) through underwriters or dealers, (2) directly to one or more purchasers, including to a limited number of institutional purchasers, to a single purchaser or to our affiliates and stockholders, (3) through agents or (4) through a combination of any of these methods.

If underwriters or dealers are used in the sale, the securities will be acquired by the underwriters or dealers for their own account and may be resold from time to time in one or more transactions, including:

in one or more transactions at a fixed price or prices, which may be changed from time to time;

in at-the-market offerings, within the meaning of Rule 415(a)(4) of the Securities Act, to or through a market maker or into an existing trading market, on an exchange or otherwise;

through a market maker or into an existing trading market on an exchange or otherwise;

at prices related to those prevailing market prices; or

at negotiated prices.

The prospectus supplement relating to any offering will set forth the following information:

the terms of the offering;

the names of any underwriters, dealers or agents;

the name or names of any managing underwriter or underwriters;

the purchase price of the securities;

the net proceeds from the sale of the securities;

any delayed delivery arrangements;

any underwriting discounts, commissions and other items constituting underwriters' compensation;

any initial public offering price;

any discounts or concessions allowed or reallocated or paid to dealers; and

any commissions paid to agents.

Sale through Underwriters or Dealers

If any securities are offered through underwriters, the underwriters will acquire the securities for their own account and may resell them from time to time in one or more transactions, including negotiated transactions, at a

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fixed public offering price or at varying prices determined at the time of sale. Underwriters may offer and sell securities to the public either through underwriting syndicates represented by one or more managing underwriters or directly by one or more firms acting as underwriters. Unless otherwise provided in the applicable prospectus supplement, the obligations of the underwriters to purchase the securities will be subject to certain conditions, and the underwriters will be obligated to purchase all of the offered securities if they purchase any of them. In connection with the sale of securities, underwriters may be deemed to have received compensation from us in the form of underwriting discounts or commissions and dealers may receive compensation from the underwriters in the form of discounts or concessions. The underwriters may change from time to time any initial public offering price and any discounts or concessions allowed or reallocated or paid to dealers.

In order to facilitate the offering of securities, the underwriters may engage in transactions that stabilize, maintain or otherwise affect the price of the securities. Specifically, the underwriters may overallocate in connection with the offering, creating a short position in the securities for their account. In addition, to cover overallocations or to stabilize the price of the shares, the underwriters may bid for, and purchase, shares in the open market. Finally, an underwriting syndicate may reclaim selling concessions allowed to an underwriter or a dealer for distributing the securities in the offering if the syndicate repurchases previously distributed shares in transactions to cover syndicate short positions, in stabilization transactions, or otherwise. Any of these activities may stabilize or maintain the market price of the offered securities above independent market levels. The underwriters are not required to engage in these activities, and may discontinue any of these activities at any time.

Some or all of the securities that we offer through this prospectus may be new issues of securities with no established trading market. Any underwriters to whom we sell securities for public offering and sale may make a market in those securities, but they will not be obligated to do so and they may discontinue any market making at any time without notice. Accordingly, we cannot assure you of the liquidity of, or continued trading markets for, any securities offered pursuant to this prospectus.

If any securities are offered through dealers, we will sell the securities to them as principals. They may then resell those securities to the public at varying prices determined by the dealers at the time of resale.

Direct Sales and Sales through Agents

We may sell the securities directly to purchasers. If the securities are sold directly to institutional investors or others who may be deemed to be underwriters within the meaning of the Securities Act with respect to any sale of those securities, we will describe the terms of any such sales in the applicable prospectus supplement. We may also sell the securities through agents designated from time to time. Sales may be made by means of ordinary brokers' transactions on the NASDAQ Global Select Market at market prices, in block transactions and such other transactions as agreed by us and any agent. In the prospectus supplement, we will name any agent involved in the offer or sale of the offered securities, and we will describe any commissions payable to the agent. Unless otherwise provided in the applicable prospectus supplement, any agent will agree to use its reasonable best efforts to solicit purchases for the period of its appointment.

At-the-Market Offerings

To the extent that we make sales through one or more underwriters or agents in at-the-market offerings, we will do so pursuant to the terms of a sales agency financing agreement or other at-the-market offering arrangement between us, on one hand, and the underwriters or agents, on the other. If we engage in at-the-market sales pursuant to any such agreement, we will issue and sell our securities through one or more underwriters or agents, which may act on an agency basis or a principal basis. During the term of any such agreement, we may sell securities on a daily basis in

exchange transactions or otherwise as we agree with the underwriters or agents. Any such agreement will provide that any securities sold will be sold at prices related to the then prevailing market prices for our securities. Therefore, exact figures regarding proceeds that will be raised or commissions to be paid cannot be determined at this time. Pursuant to the terms of the agreement, we may agree to sell, and the

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relevant underwriters or agents may agree to solicit offers to purchase blocks of our common stock or other securities. The terms of any such agreement will be set forth in more detail in the applicable prospectus or prospectus supplement.

Remarketing Arrangements

Offered securities may also be offered and sold, if we so indicate in the applicable prospectus supplement, in connection with a remarketing upon their purchase, in accordance with a redemption or repayment pursuant to their terms, or otherwise, by one or more remarketing firms, acting as principals for their own accounts or as our agents. Any remarketing firm will be identified and the terms of its agreements, if any, with us and its compensation will be described in the applicable prospectus supplement. Remarketing firms may be deemed to be underwriters of the offered securities under the Securities Act.

Delayed Delivery Contracts

If we so indicate in the applicable prospectus supplement, we may authorize agents, underwriters or dealers to solicit offers by certain institutions to purchase securities from us pursuant to contracts providing for payment and delivery on a specified future date. The applicable prospectus supplement will describe the conditions to those contracts and the commission payable for solicitation of those contracts.

General Information

We may have agreements with the agents, dealers, underwriters and remarketing firms to indemnify them against certain civil liabilities, including liabilities under the Securities Act, or to contribute with respect to payments that the agents, dealers or underwriters may be required to make. Agents, dealers, underwriters and remarketing firms may be customers of, engage in transactions with or perform services for us in the ordinary course of their businesses.

Each underwriter, dealer and agent participating in the distribution of any of the securities that are issuable in bearer form will agree that it will not offer, sell or deliver, directly or indirectly, securities in bearer form in the United States or to United States persons, other than qualifying financial institutions, during the restricted period, as defined in United States Treasury Regulations Section 1.163-5(c)(2)(i)(D)(7).

SELLING STOCKHOLDERS

This prospectus also relates to the possible resale by certain of our stockholders, who we refer to in this prospectus as the selling stockholders, of up to 10,687,733 shares of our common stock that were issued and outstanding prior to the original filing date of the registration statement of which this prospectus forms a part or are issuable upon the exercise of warrants or options to acquire shares of our common stock that were issued and outstanding prior to the original filing date of the registration statement of which this prospectus forms a part. The selling stockholders originally acquired the shares of our common stock included in this prospectus through several private placements of our common stock and our convertible preferred stock prior to our initial public offering, with all such shares of convertible preferred stock converted into shares of our common stock in connection with our initial public offering, and warrants exercisable for shares of our common stock, as described under **Description of Capital Stock Outstanding Warrants**. Information about the selling stockholders, where applicable, including their identities and the number of shares of common stock to be registered on their behalf, will be set forth in an applicable prospectus supplement, documents incorporated by reference or in a free writing prospectus we file with the SEC. The selling stockholders shall not sell any shares of our common stock pursuant to this prospectus until we have identified such selling stockholders and the shares being offered for resale by such selling stockholders in a subsequent prospectus

supplement. However, the selling stockholders may sell or transfer all or a portion of their shares of our common stock pursuant to any available exemption from the registration requirements of the Securities Act.

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PLAN OF DISTRIBUTION FOR SHARES OFFERED BY THE SELLING STOCKHOLDERS

The selling stockholders may offer and sell all or a portion of the shares of common stock, including common stock underlying warrants, covered by this prospectus from time to time, in one or more or any combination of the following transactions:

on The NASDAQ Global Select Market, in the over-the-counter market or on any other securities exchange, market or trading facility on which our shares are listed or traded;

in privately negotiated transactions;

in underwritten transactions;

in a block trade in which a broker-dealer will attempt to sell the offered shares as agent but may position and resell a portion of the block as principal to facilitate the transaction;

in an exchange distribution in accordance with the rules of the applicable exchange;

settlement of short sales entered into after the effective date of the registration statement of which this prospectus is a part;

through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;

through purchases by a broker-dealer as principal and resale by the broker-dealer for its account pursuant to this prospectus;

in ordinary brokerage transactions and transactions in which the broker solicits purchasers;

a combination of any such methods of sale; or

any other method permitted pursuant to applicable law.

The selling stockholders may sell the shares at prices then prevailing or related to the then current market price or at negotiated prices. The offering price of the shares from time to time will be determined by the selling stockholders and, at the time of the determination, may be higher or lower than the market price of our common stock on The NASDAQ Global Select Market or any other exchange or market.

The shares may be sold directly or through broker-dealers acting as principal or agent, or pursuant to a distribution by one or more underwriters on a firm commitment or best-efforts basis. In connection with an underwritten offering, underwriters or agents may receive compensation in the form of discounts, concessions or commissions from the selling stockholders or from purchasers of the offered shares for whom they may act as agents. In addition, underwriters may sell the shares to or through dealers, and those dealers may receive compensation in the form of discounts, concessions or commissions from the underwriters or commissions from the purchasers for whom they may act as agents. In connection with any particular offering of shares, an underwriter may engage in stabilizing transactions, short sales, syndicate covering transactions and penalty bids. The selling stockholders and any underwriters, dealers or agents participating in a distribution of the shares may be deemed to be underwriters within the meaning of the Securities Act, and any profit on the sale of the shares by the selling stockholders and any commissions received by broker-dealers may be deemed to be underwriting commissions under the Securities Act. Broker-dealers may receive commissions or discounts from the selling stockholders (or, if any broker-dealer acts as agent for the purchaser of shares, from the purchaser) in amounts to be negotiated, but, except as set forth in a supplement to this prospectus, in the case of an agency transaction not in excess of a customary brokerage commission in compliance with NASD Rule 2440 of the Financial Industry Regulatory Authority (FINRA); and in the case of a principal transaction a markup or markdown in compliance with FINRA 's NASD IM-2440.

In connection with the sale of the shares, 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 shares in the course

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of hedging the positions they assume. The selling stockholders may also sell shares of our common stock short and deliver these securities to close out their short positions, or loan or pledge the shares to broker-dealers that in turn may sell these securities. The selling stockholders may also enter into option or other transactions with broker-dealers or other financial institutions for the creation of one or more derivative securities which require the delivery to such broker-dealer or other financial institution of shares of our common stock, which shares such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

The selling stockholders may agree to indemnify an underwriter, broker-dealer or agent against certain liabilities related to the selling of the common stock, including liabilities arising under the Securities Act. We will not be responsible for any underwriting discounts or commissions associated with the sale of such shares.

We are not aware that the selling stockholders have entered into any agreements, understandings or arrangements with any underwriters or broker-dealers regarding the sale of their shares of common stock. Upon our notification by the selling stockholders that any material arrangement has been entered into with an underwriter or broker-dealer for the sale of shares through a block trade, special offering, exchange distribution, secondary distribution or a purchase by an underwriter or broker-dealer, we will file a supplement to this prospectus, if required, pursuant to Rule 424(b) under the Securities Act, disclosing certain material information, including:

the names of the selling stockholders;

the number of shares being offered;

the terms of the offering;

the names of the participating underwriters, broker-dealers or agents;

any discounts, commissions or other compensation paid to underwriters or broker-dealers and any discounts, commissions or concessions allowed or reallocated or paid by any underwriters to dealers;

the public offering price; and

other material terms of the offering.

The selling stockholders are subject to the applicable provisions of the Exchange Act and the rules and regulations under the Exchange Act, including Regulation M. This regulation may limit the timing of purchases and sales of any of the shares of common stock offered in this prospectus by the selling stockholders. The anti-manipulation rules under the Exchange Act may apply to sales of shares of common stock in the market and to the activities of the selling stockholders and their affiliates. Furthermore, Regulation M may restrict the ability of any person engaged in the distribution of the shares to engage in market-making activities for the particular securities being distributed for a period of up to five business days before the distribution. The restrictions may affect the marketability of the shares of common stock and the ability of any person or entity to engage in market-making activities for the shares of common

stock.

To the extent required, this prospectus may be amended or supplemented from time to time to describe a specific plan of distribution. The selling stockholders may sell the shares of common stock in compliance with the provisions of Rule 144 under the Securities Act, if available, or pursuant to other available exemptions from the registration requirements of the Securities Act.

The shares of common stock registered hereunder will be sold only through registered or licensed brokers or dealers if required under applicable state securities laws. In addition, in certain states, such shares may not be sold unless they have been registered or qualified for sale in the applicable state or an exemption from the registration or qualification requirement is available and is complied with.

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LEGAL MATTERS

Sidley Austin LLP, Palo Alto, California will issue an opinion regarding the legality of certain of the offered securities. Any underwriters will be advised about other issues relating to any offering by their own legal counsel.

EXPERTS

The consolidated financial statements incorporated in this prospectus by reference from the Company's Annual Report on Form 10-K, have been audited by Deloitte & Touche LLP, an independent registered public accounting firm, as stated in their report, which is incorporated herein by reference. Such financial statements have been so incorporated in reliance upon the report of such firm given upon their authority as experts in accounting and auditing.

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2,750,000 Shares

Common Stock

PROSPECTUS SUPPLEMENT

Joint Book-Running Managers

Jefferies

Leerink Partners
Lead Manager

Cowen and Company

Stifel

, 2015