



This free writing prospectus relates only to the securities described below and should be read together with the preliminary prospectus dated September 18, 2015 relating to this offering (the "Preliminary Prospectus"), included in Amendment No. 2 to the Registration Statement on Form S-1 (File No. 333-206544) relating to these securities. The most recent amendment to such Registration Statement can be accessed through the following link: <http://www.sec.gov/Archives/edgar/data/1527599/000104746915007609/0001047469-15-007609-index.htm>

The following information is intended to update and supplement the information contained in the Preliminary Prospectus.

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| Common Stock offered by us: | 6,250,000 shares (or 7,187,500 shares if the underwriters exercise their option to purchase additional shares in full) |
| Common Stock sold in the concurrent private placement: | In connection with a research grant awarded to us, the Cancer Prevention and Research Institute of Texas, or CPRIT, has agreed to purchase from us concurrently with this offering in a private placement approximately \$16.8 million of our common stock at a price per share equal to the initial public offering price, or 2,395,010 shares, at the expected initial public offering price of \$7.00 per share. We will receive the full proceeds from the sale and will not pay any underwriting discounts or commissions with respect to the shares that are sold in the private placement. The sale of these shares to CPRIT will not be registered under the Securities Act of 1933, as amended, and these shares will be subject to a 180 day lock up agreement with the underwriters in this offering. We refer to the private placement of these shares of common stock as the "concurrent private placement." |
| Common Stock issuable pursuant to the accruing paid-in-kind dividend: | Approximately 1,158,443 shares of our common stock are issuable to the holders of Series C convertible preferred stock and Series D convertible preferred stock under the terms of our certificate of incorporation as a result of the accruing paid-in-kind dividend in connection with the conversion of all shares of Series C convertible preferred stock and Series D convertible preferred stock into shares of common stock immediately prior to the consummation of this offering based on the expected initial public offering price of \$7.00 per share and an assumed conversion date of September 15, 2015. |
| Common Stock to be outstanding after this offering, the concurrent private placement and the accruing paid-in-kind dividend: | 20,056,726 shares (or 20,994,226 shares if the underwriters exercise their option to purchase additional shares in full) |
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| Expected initial public offering price per share: | \$7.00 per share |
| Potential purchases by existing stockholders: | <p>Certain of our existing institutional investors, including investors affiliated with certain of our directors, have indicated an interest in purchasing an aggregate of up to approximately \$17.0 million of shares of our common stock in this offering at the initial public offering price and on the same terms as the other purchasers in this offering. However, because indications of interest are not binding agreements or commitments to purchase, these investors may determine to purchase fewer shares than they indicate an interest in purchasing or not to purchase any shares in this offering. It is also possible that these investors could indicate an interest in purchasing more shares of our common stock. In addition, the underwriters could determine to sell fewer shares to any of these investors than the investors indicate an interest in purchasing or not to sell any shares to these investors.</p> <p>Any such purchases, if completed, would be made on the same terms as the shares that are sold to the public generally and not pursuant to any pre-existing contractual rights or obligations. If such investors purchase all shares they have indicated interests in purchasing, our officers and directors, together with holders of 5% or more of our outstanding common stock before this offering and their respective affiliates, and CPRIT, will beneficially own approximately 68.0% of our common stock upon the closing of this offering (assuming no exercise of the underwriters' option to purchase additional shares and no exercise of outstanding options).</p> |
| Use of Proceeds: | We estimate that the net proceeds from this offering, excluding the proceeds from the concurrent private placement, will be approximately \$39.1 million, based on the expected initial public offering price of \$7.00 per share, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us. |

If the underwriters exercise their option to purchase additional shares in full, we estimate that net proceeds from this offering will be approximately \$45.2 million after deducting the underwriting discounts and commissions and estimated offering expenses payable by us. Each \$1.00 increase (decrease) in the expected initial public offering price of \$7.00 per share would increase (decrease) the net proceeds to us from this offering, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us, by approximately \$5.8 million,

assuming that the number of shares offered by us in this offering remains the same. We may also increase or decrease the number of shares we are offering. An increase (decrease) of 1,000,000 in the number of shares we are offering in this offering would increase (decrease) the net proceeds to us from this offering, after deducting the underwriting discounts and commissions and estimated offering expenses payable by us, by approximately \$6.5 million, assuming the expected initial public offering price stays the same. We do not expect that a change in the offering price or the number of shares by these amounts would have a material effect on our intended uses of the net proceeds from this offering or the concurrent private placement, although it may impact the amount of time prior to which we may need to seek additional capital.

We currently estimate that we will use the net proceeds from this offering, together with the net proceeds from the concurrent private placement as noted below and our existing cash and cash equivalents, as follows:

- approximately \$52.0-\$62.0 million to fund clinical development expenses for our lead program, MRX34, which includes
 - approximately \$13.0-\$16.0 million to complete the Phase 1 clinical trial, including expansion cohorts on multiple indications and/or changes in protocol,
 - approximately \$15.0-\$18.0 million to initiate the Phase 2 clinical trial for an indication to be determined, and
 - approximately \$24.0-\$28.0 million, which will include the net proceeds from the concurrent private placement, to fund preclinical and clinical studies for the use of MRX34 in combination with standard of care drugs,
 - approximately \$21.0-\$25.0 million to fund preclinical and clinical studies for a second product candidate using another to be determined mimic product, and
 - the remainder for preclinical studies, working capital and other general corporate purposes, which may include pursuit of our other research and discovery efforts, expenditures on intellectual property and the acquisition or in-license of other products, product candidates or technologies.
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In connection with a research grant awarded to us, CPRIT has agreed to purchase from us concurrently with this offering in a private placement approximately \$16.8 million of our common stock at a price per share equal to the initial public offering price. Our proceeds from the sale of the common stock sold in the concurrent private placement will be approximately \$16.8 million.

Pro forma as adjusted balance sheet data:

Based upon the expected initial public offering price of \$7.00 per share, as of June 30, 2015, on a pro forma as adjusted basis, cash and cash equivalents would have been approximately \$97.4 million, total assets would have been approximately \$98.0 million and total stockholders' equity would have been approximately \$94.9 million.

Each \$1.00 increase (decrease) in the expected initial public offering price of \$7.00 per share would increase (decrease) each of pro forma as adjusted additional paid-in capital and stockholders' equity by approximately \$5.8 million, assuming that the number of shares offered by us in this offering remains the same. We may also increase or decrease the number of shares we are offering. An increase (decrease) of 1,000,000 in the number of shares we are offering in this offering would increase (decrease) each of pro forma as adjusted additional paid-in capital and stockholders' equity by approximately \$6.5 million, assuming the expected initial public offering price per share remains the same.

Pro forma as adjusted capitalization:

Based upon the expected initial public offering price of \$7.00 per share, as of June 30,

2015, on a pro forma as adjusted basis, additional paid-in capital would have been approximately \$155.1 million, total stockholders' equity would have been approximately \$94.9 million and total capitalization would have been approximately \$94.9 million.

Dilution:

After giving effect to the sale of shares of common stock in this offering, the concurrent private placement and the issuance of 972,571 shares of common stock pursuant to the accruing paid-in-kind dividend in connection with this offering (assuming a conversion date of June 30, 2015), in each case at the expected initial public offering price of \$7.00 per share and after deducting the underwriting discounts and commissions and estimated offering expenses, our pro forma as adjusted net tangible book value at June 30, 2015 would have been approximately \$94.9 million, or \$4.78 per share. This represents an immediate increase in pro forma as adjusted net tangible book value of \$0.97 per share to existing stockholders and an

immediate dilution of \$2.22 per share to new investors participating in this offering.

Based upon the expected initial public offering price of \$7.00 per share, after giving effect to this offering, the concurrent private placement and the accruing paid-in-kind dividend in connection with this offering, purchasers of common stock in this offering will have contributed approximately 29.1% of the aggregate purchase price paid by all purchasers of our stock and will own approximately 31.5% of our common stock outstanding after this offering.

Mirna Therapeutics, Inc. has filed a registration statement (including a prospectus) with the Securities and Exchange Commission (SEC) for the offering to which this communication relates. Before you invest, you should read the prospectus in that registration statement and other documents Mirna has filed with the SEC for more complete information about Mirna and this offering. You may get these documents for free by visiting EDGAR on the SEC website at www.sec.gov. Alternatively, Mirna, any underwriter or any dealer participating in the offering will arrange to send you the prospectus if you request it by contacting Citigroup Global Markets Inc. at (212) 816-6000 or Leerink Partners LLC at (800) 808-7525.
