

March 27, 2014

David M. Nierengarten, Ph.D. (415) 274-6862

Gregory R. Wade, Ph.D. (415) 274-6863

Christopher N. Marai, Ph.D. (415) 274-6861

Dilip Joseph (415) 273-7308

bluebird bio (BLUE - OUTPERFORM): First Beta-Thal Patient Enrolled in US Study of LentiGlobin, Reiterate OUTPERFORM

Price: \$22.01

12-Month Price Target: \$40

- **BLUE announced the treatment of the first patient in the Phase I/II Northstar (HGB-204) study of LentiGlobin in beta thalassemia.** The trial should enroll up to 15 patients in the US, with interim data expected in late 2014. The co-primary endpoints of the study include efficacy, as measured by production of hemoglobin containing the beta-globin transgene, and safety over two years post-transplant. We would expect the interim data, when released, to include analysis of hemoglobin levels, LentiGlobin vector measurements and any changes in transfusion frequency.
- **A separate Phase I/II study (HGB-205) of LentiGlobin in up to seven patients with beta thalassemia or sickle cell disease (SCD) is ongoing in France.** BLUE plans to file an IND in mid-14 and start a trial in H2:14 exploring the use of LentiGlobin for SCD in the US.
- **BLUE's lead product candidate, Lenti-D, is currently being evaluated in the ongoing Phase II/III Starbeam trial for childhood cerebral adrenoleukodystrophy (CCALD).** We continue to view the lack of news from any of BLUE's clinical programs as a positive indicator of safety.
- **With expanding clinical programs and a promising preclinical CAR-T program with Celgene, we view BLUE as a leading play in the cross section of gene therapy and oncology and continue to recommend the shares.**
- **Reiterate OUTPERFORM and \$40 price target.** Our price target of \$40 is derived from applying an 8X multiple to estimated 2020 revenues of \$1.36B for Lenti-D and LentiGlobin products, discounted 35% annually. We do not include CAR-T (chimeric antigen receptor T-cells, partnered with Celgene (CELG, not covered) in our valuation.

Risks to the achievement of our price target include failure to gain approval for products in development, failure to achieve sales estimates for any marketed product and failure to achieve earnings estimates.

Wedbush Securities does and seeks to do business with companies covered in its research reports. Thus, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision. Please see page 2 of this report for analyst certification and important disclosure information.

Analyst Certification

I, David M. Nierengarten, Ph.D., Gregory R. Wade, Ph.D., Christopher N. Marai, Ph.D., Dilip Joseph, certify that the views expressed in this report accurately reflect my personal opinion and that I have not and will not, directly or indirectly, receive compensation or other payments in connection with my specific recommendations or views contained in this report.

Disclosure information regarding historical ratings and price targets is available at <http://www.wedbush.com/ResearchDisclosure/DisclosureQ413.pdf>

Investment Rating System:

Outperform: Expect the total return of the stock to outperform relative to the median total return of the analyst's (or the analyst's team) coverage universe over the next 6-12 months.

Neutral: Expect the total return of the stock to perform in-line with the median total return of the analyst's (or the analyst's team) coverage universe over the next 6-12 months.

Underperform: Expect the total return of the stock to underperform relative to the median total return of the analyst's (or the analyst's team) coverage universe over the next 6-12 months.

The Investment Ratings are based on the expected performance of a stock (based on anticipated total return to price target) relative to the other stocks in the analyst's coverage universe (or the analyst's team coverage).*

Rating Distribution (as of December 31, 2013)	Investment Banking Relationships (as of December 31, 2013)
Outperform: 54%	Outperform: 18%
Neutral: 43%	Neutral: 2%
Underperform: 3%	Underperform: 0%

The Distribution of Ratings is required by FINRA rules; however, WS' stock ratings of Outperform, Neutral, and Underperform most closely conform to Buy, Hold, and Sell, respectively. Please note, however, the definitions are not the same as WS' stock ratings are on a relative basis.

The analysts responsible for preparing research reports do not receive compensation based on specific investment banking activity. The analysts receive compensation that is based upon various factors including WS' total revenues, a portion of which are generated by WS' investment banking activities.

Wedbush Equity Research Disclosures as of March 27, 2014

Company	Disclosure
bluebird bio	1,3,4,5

Research Disclosure Legend

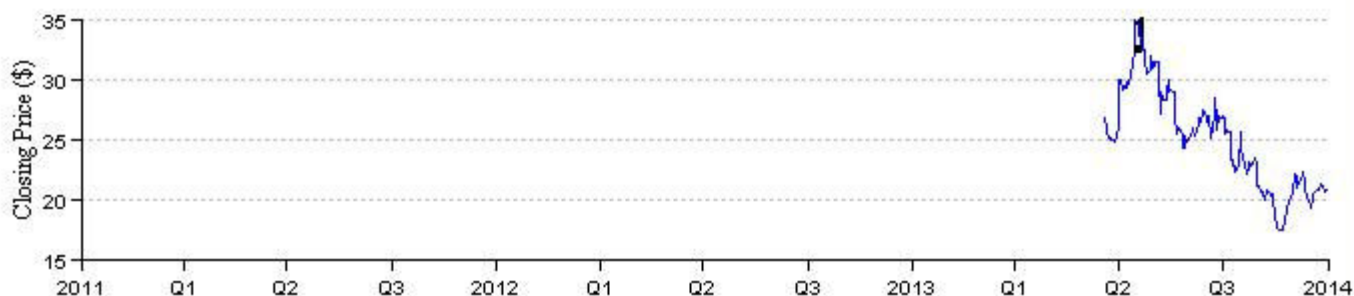
1. WS makes a market in the securities of the subject company.
2. WS managed a public offering of securities within the last 12 months.
3. WS co-managed a public offering of securities within the last 12 months.
4. WS has received compensation for investment banking services within the last 12 months.
5. WS provided investment banking services within the last 12 months.
6. WS is acting as financial advisor.
7. WS expects to receive compensation for investment banking services within the next 3 months.
8. WS provided non-investment banking securities-related services within the past 12 months.
9. WS has received compensation for products and services other than investment banking services within the past 12 months.
10. The research analyst, a member of the research analyst's household, any associate of the research analyst, or any individual directly involved in the preparation of this report has a long position in the common stocks.
11. WS or one of its affiliates beneficially own 1% or more of the common equity securities.
12. The analyst maintains Contingent Value Rights that enables him/her to receive payments of cash upon the company's meeting certain clinical and regulatory milestones.

Price Charts

Wedbush disclosure price charts are updated within the first fifteen days of each new calendar quarter per FINRA regulations. Price charts for companies initiated upon in the current quarter, and rating and target price changes occurring in the current quarter, will not be displayed until the following quarter. Additional information on recommended securities is available on request.

BLUE

1) 07/15/13
OUTPERFORM \$40



* WS changed its rating system from (Strong Buy/Buy/Hold/Sell) to (Outperform/ Neutral/Underperform) on July 14, 2009.

Please access the attached hyperlink for WS' Coverage Universe: <http://www.wedbush.com/services/cmg/equities-division/research/equity-research>. Applicable disclosure information is also available upon request by contacting Ellen Kang in the Research Department at (213) 688-4529, by email to ellen.kang@wedbush.com, or the Business Conduct Department at (213) 688-8090. You may also submit a written request to the following: Business Conduct Department, 1000 Wilshire Blvd., Los Angeles, CA 90017.

OTHER DISCLOSURES

RESEARCH DEPT. * (213) 688-4505 * www.wedbush.com

EQUITY TRADING Los Angeles (213) 688-4470 / (800) 421-0178 * EQUITY SALES Los Angeles (800) 444-8076

CORPORATE HEADQUARTERS (213) 688-8000

The information herein is based on sources that we consider reliable, but its accuracy is not guaranteed. The information contained herein is not a representation by this corporation, nor is any recommendation made herein based on any privileged information. This information is not intended to be nor should it be relied upon as a complete record or analysis; neither is it an offer nor a solicitation of an offer to sell or buy any security mentioned herein. This firm, Wedbush Securities, its officers, employees, and members of their families, or any one or more of them, and its discretionary and advisory accounts, may have a position in any security discussed herein or in related securities and may make, from time to time, purchases or sales thereof in the open market or otherwise. The information and expressions of opinion contained herein are subject to change without further notice. The herein mentioned securities may be sold to or bought from customers on a principal basis by this firm. Additional information with respect to the information contained herein may be obtained upon request.

WEDBUSH

EQUITY RESEARCH DEPARTMENT

(213) 688-4529

DIRECTOR OF RESEARCH

Mark D. Benson (213) 688-4435

MANAGER, RESEARCH OPERATIONS

Ellen Kang (213) 688-4529

RETAIL AND CONSUMER

Consumer Products

Rommel T. Dionisio (212) 938-9934
Kurt M. Frederick, CFA CPA (415) 274-6822
Alicia Reese (212) 938-9927

Footwear, Apparel and Accessories

Corinna Freedman (212) 668-9876

Healthy Lifestyles

Kurt Setyan (415) 274-6822
Alicia Reese (212) 938-9927

Restaurants

Nick Setyan (213) 688-4519
Colin Radke (213) 688-6624

Specialty Retail: Hardlines

Joan L. Storms, CFA (213) 688-4537
John Garrett, CFA (213) 688-4523

Seth Basham, CFA (212) 938-9954

Specialty Retail: Softlines

Morry Brown (213) 688-4311
Taryn Kuida (213) 688-4505

RETAIL/CONSUMER MARKET RESEARCH

Gabriella Santaniello (213) 688-4557

INDUSTRIAL GROWTH TECHNOLOGY

Clean Technology

Craig Irwin (212) 938-9926
Min Xu (212) 938-9925

Environmental Services / Building Products

Al Kaschalk (213) 688-4539

Water and Renewable Energy Solutions

David Rose, CFA (213) 688-4319
James Kim (213) 688-4380

TECHNOLOGY, INTERNET, MEDIA & SOCIAL MEDIA

Communications and Application Software

Shyam Patil, CFA (213) 688-8062
Andy Cheng (213) 688-4548

Enterprise Security

Sanjit Singh (212) 938-9922

Computer Services: Financial Technology

Gil B. Luria (213) 688-4501
Aaron Turner (213) 688-4429

Enterprise Software

Steve Koenig (415) 274-6801
Kevin Ikeda (213) 688-4423

Entertainment: Retail

Michael Pachter (213) 688-4474
Nick McKay (213) 688-4343
Nick Citrin (213) 688-4495

Entertainment: Software

Michael Pachter (213) 688-4474
Nick McKay (213) 688-4343
Nick Citrin (213) 688-4495

Internet: Media and Gaming

Michael Pachter (213) 688-4474
Nick McKay (213) 688-4343
Nick Citrin (213) 688-4495

Internet: Social Media, Advertising & Technology

Shyam Patil, CFA (213) 688-8062
Andy Cheng (213) 688-4548

Media

James Dix, CFA (213) 688-4315

Movies and Entertainment

Michael Pachter (213) 688-4474
Nick McKay (213) 688-4343
Nick Citrin (213) 688-4495

Semiconductors

Betsy Van Hees (415) 274-6869
Ryan Jue, CFA (415) 263-6669

LIFE SCIENCES AND HEALTH CARE

Biotechnology/Biopharmaceuticals/BioDefense

Gregory R. Wade, Ph.D. (415) 274-6863
David M. Nierengarten, Ph.D. (415) 274-6862
Christopher N. Marai, Ph.D. (415) 274-6861
Dilip Joseph (415) 273-7308

Emerging Pharmaceuticals

Liana Moussatos, Ph.D. (415) 263-6626

Healthcare Services - Managed Care

Sarah James (213) 688-4503

Medical Devices

Tao Levy (212) 938-9948

Medical Diagnostics and Life Sciences Tools

Zarak Khurshid (415) 274-6823

EQUITY SALES

Los Angeles (213) 688-4470 / (800) 444-8076
San Francisco (415) 274-6800
New York (212) 938-9931
Boston (617) 832-3700

EQUITY TRADING

Los Angeles (213) 688-4470 / (800) 421-0178
San Francisco (415) 274-6811
New York (212) 344-2382
Boston (617) 832-3700

CORPORATE HEADQUARTERS

1000 Wilshire Blvd., Los Angeles, CA 90017-2465

Tel: (213) 688-8000 www.wedbush.com