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

DIVISION OF
CORPORATION FINANCE

April 17, 2013

Via E-mail
Nick Leschly
President and Chief Executive Officer
bluebird bio, Inc.
840 Memorial Drive, 4th Floor
Cambridge, MA 02139

Re: bluebird bio, Inc.
Draft Registration Statement on Form S-1
Submitted March 21, 2013
CIK No. 0001293971

Dear Mr. Leschly:

We have reviewed your draft registration statement and have the following comments. In some of our comments, we may ask you to provide us with information so we may better understand your disclosure.

Please respond to this letter by providing the requested information and either submitting an amended draft registration statement or publicly filing your registration statement on EDGAR. If you do not believe our comments apply to your facts and circumstances or do not believe an amendment is appropriate, please tell us why in your response.

After reviewing the information you provide in response to these comments and your amended draft registration statement or filed registration statement, we may have additional comments.

General

1. Please submit all exhibits as soon as practicable. We may have further comments upon examination of these exhibits.

2. Please provide us proofs of all graphic, visual or photographic information you will provide in the printed prospectus prior to its use, for example in a preliminary prospectus. Please note that we may have comments regarding this material.

3. Please supplementally provide us with copies of all written communications, as defined in Rule 405 under the Securities Act, that you, or anyone authorized to do so on your behalf, present to potential investors in reliance on Section 5(d) of the Securities Act, whether or not they retain copies of the communications. Similarly, please supplementally provide us with any research reports about you that are published or

distributed in reliance upon Section 2(a)(3) of the Securities Act of 1933 added by Section 105(a) of the Jumpstart Our Business Startups Act by any broker or dealer that is participating or will participate in your offering.

4. Comments to your application for confidential treatment will be delivered under separate cover.

Prospectus Summary, page 1

5. Some of your disclosure in the summary includes scientific or statistical terms that may be unfamiliar to lay readers. Where appropriate, please expand your disclosure to include explanations of terminology so that it may be understood by average investors. Portions of your registration statement that include such terminology or terms used that merit further explanation include:
    - The second full paragraph on page 2, in particular please the actions of viral vectors in gene therapy;
    - transduce;
    - adeno-associated virus;
    - aberrant expression;
    - autologous, gene-modified HSCs;
    - non-interventional retrospective data collection study; and
    - vaso-occlusive crises.

6. Given the use of a large number of acronyms throughout the filing, please consider including a glossary of the material acronyms used in the prospectus or re-define the relevant acronyms at the beginning of the MD&A and Business sections.

Our product candidate pipeline, page 3

7. Please revise your graphical depiction of your product candidate pipeline here and on page 90 to indicate that:

    - You have not conducted any human clinical studies of your current viral vectors nor your product candidates. Please remove from your graph the prior studies that used other viral vectors. You may separately note the prior studies in the relevant indications in a footnote; and
    - Your HGB-205 Study and your NORTHSTAR Study are Phase I/II studies. Please revise the graph to only depict each of the studies in this column.

8. Please add narrative disclosure to your graphical depiction of your product candidate pipeline to indicate your proposed timeline where available and the respective regulatory status. For example, please indicate for Lenti-D for Childhood Cerebral ALD that you do not have an active IND and plan to file one in early 2013 and expect to commence in the second half of 2013. Please also revise your disclosure regarding LentiGlobin to note

that you have not sought an IND with respect to the SCD indication. Please also revise your disclosure in your Business section.

9. Please refer consistently to your proposed Phase II/III clinical study to evaluate your Lenti-D product candidate in CCALD as either ALD-102 Study or COMET Study. It is confusing to use two different terms for the same study throughout the filing. Similarly, please revise your discussion regarding your HGB-204 Study or NORTHSTAR Study.

10. Please include a brief description of the CCALD, ß-thalassemia and SCD including the potential patient population for each. Please also include the estimated potential patient population in your risk factor starting on page 15.

Risks related to our business, page 5

11. Please expand your disclosure in this section to disclose that:
    - No gene therapy products have been approved in the United States and only one product has been approved in Europe;
    - Neither your current viral vectors nor your product candidates have ever been evaluated in human clinical studies, and you may experience unexpected results in the future; and
    - In previous clinical studies involving viral vectors for gene therapy, some subjects experienced serious adverse events, including the development of leukemia due to vector-related insertional oncogenesis and some deterioration of neurological function.

Risk Factors
"We face potential product liability…," page 32

12. Please quantify the level of coverage of your product liability insurance.

"We will incur significant increased costs as a result of operating as a public company…," page 34

13. Please include in this risk factor an estimate of the annual compliance costs you will incur as a result of your reporting obligations as a public company.

"If we fail to comply with our obligations in the agreements under which we license…," page 38

14. Please expand your disclosure in this risk factor to identify the intellectual property license agreements that are important to your business and disclose the termination provisions of those agreements.

Use of proceeds, page 53

15. Please specify more clearly how the proceeds will be allocated among your ongoing clinical development and research including placeholders for estimates of the amounts to be spent on each of the specified projects and how such projects will be prioritized. Please also disclose the stage of development that you expect the proceeds to achieve for each clinical study and product candidate.

16. Please provide a brief outline of each material capital expenditure and estimate the amount to be spent on each proposed expenditure. See Instruction 2 to Item 504 of Regulation S-K.

Management's discussion and analysis of financial condition and results of operations
Overview, page 61

17. Here and throughout your filing, please state with respect to your plans to commence enrollment in 2013 of a Phase II/III clinical study of Lenti-D in subjects with CCALD that this plan is subject to filing and acceptance of an IND with the FDA.

Research and Development expenses, page 63

18. Regarding the table provided that identifies research and development expenses for the years ended December 31, 2011 and 2012, please revise to disaggregate the personnel and other expenses line item by the nature of each expense, if significant in relation to the total unallocated expenses.

Critical accounting policies and significant judgments and estimates
Stock-based compensation
Stock-based awards, page 66

19. To gain a better understanding of your determination of the fair market value of your common stock at each valuation date, please provide us the following information in revised disclosure, as applicable:

    - Disclose the guideline public companies that you selected and what similarities existed between you and the guideline public companies selected such as number of products, types of products, size, working capital, liquidity, etc. Specify any adjustments that were made to reflect differences between you and the public companies selected;
    - Disclose the methodology used to determine your expected volatility factor from the data obtained for the selected companies;
    - For each valuation date:
        - Disclose how you determined the discount for lack of marketability assumption and why the discount is appropriate;

- Disclose why the liquidity date is appropriate;

20. Regarding the July 23, 2012 valuation, please address the following comments:
    - Revise your disclosure to clarify the factors considered to determine the expected future investment returns;
    - Revise your disclosure to describe "the possible outcomes" that were available to you;
    - Disclose the risk-adjusted rate used and why it was appropriate; and
    - Tell us what you did prior to and/or at the valuation date that made you believe there was the possibility of an IPO.

21. Regarding the December 31, 2012 valuation:
    - Disclose the risk-adjusted rate used and why it was appropriate;
    - Describe how you determined the present value of your equity in a future IPO;
    - Describe what management had done since July 2012 in preparing for a potential IPO; and
    - Tell us why a "potential" partnership with a leading pharmaceutical company would be a factor that would increase the per share value of your common stock. In this regard, tell us what management had done prior to and/or at the valuation date with regards to signing a partnership agreement.

Contractual obligations and commitments, page 79

22. Regarding your obligation to make future payments to third parties on the achievement of milestones, please quantify the amount of milestones for each commitment (e.g. Inserm-Transfert, Institut Pasteur, Stanford, MIT, and Research Development Foundation) into meaningful categories such as development, regulatory, and/or commercial milestones. In addition, please disclose the nature of the underlying events which trigger the milestone payments.

Business
Gene therapy – the time is now, page 82

23. Please expand your disclosure on page 83 to quantify the investments made by Sanofi/Genzyme and Shire plc.

Our proprietary lentiviral vectors, page 85

24. Please describe and explain further a vector delivery system and your viral vector approach. Please describe each generally and explain how they act in the specific context of your lentiviral vectors and your gene therapy platform. Please add similar clarifying explanations to the prospectus summary.

25. Please expand your disclosure to include more information regarding the basis for your statement that "Next-generation, lentiviral vectors have a distinct pattern of integrating into the gene rather than the promoter region of the gene which we believe is a critical factor in improving the safety profile of the vector, and distinguishes them from earlier generation of integrating viral vectors."

26. Please describe the effect of the increased carrying capacity of the lentivirus as compared to AAV.

27. You state that "AAV does not integrate into the chromosomes and requires hundreds to thousands of viral genomes to deliver sufficient number of gene copies for functional correction." Please further describe how the lentiviral vectors you have developed differ from AAV in their mechanism of action or procedures. Your disclosure as it is now only indicates the advantages of the lentivirus over AAV without further context for your comparisons.

Our therapeutic approach, page 87

28. Please disclose the approximate length of time from the mobilization and extraction of the patient's cells to the re-infusion of the patient's cells. In addition, disclose the approximate range of time after the re-infusion of cells to the point where you believe that the patient will not experience any major functional disabilities or other key assessments of disease progression for CCALD or will not require transfusion requirements for ß-thalassemia or SCD.

Our product candidate pipeline, page 90

29. You disclose that you are currently conducting a Phase I/II clinical study for LentiGlobin in France for both ß-thalassemia major and SCD. Please clarify here that you are not using your current LentiGlobin vector in this study.

Our Lenti-D product candidate, page 93

30. Please either differentiate more clearly whether the term CD34+ refers to the modified HSCs that include the functional copy of the ABCD1 gene or consistently refer to HSCs or CD34+ throughout the filing. It is confusing to use two different terms for the same thing throughout the filing.

31. Please expand your disclosure here and on page 100 to disclose that the FDA has advised you that your COMET Study may not be deemed a pivotal study or may not support a BLA submission and that the FDA normally requires two pivotal studies to approve a product.

Clinical development of our Lenti-D product candidate
Completed non-interventional retrospective study (the ALD-101 Study), page 94

32. Please provide further context for the MRI scans included on page 95 to more specifically indicate what each scan shows, compare the disease progression in each scan and indicate whether the dark or light matter represents disease progression. In addition, please disclose whether you believe these scans illustrate the typical progression of the disease in a patient with CCALD and how MRI scans can vary in patients with CCALD. If disease progression can vary significantly, please consider providing additional examples that illustrate the range of progression.

33. For each bullet point summarizing the key findings of the ALD-101 Study, please summarize, as you did on page 97 in the bullet point describing mortality, how the results of the analysis affected your design of the COMET Study.

Previous clinical experience with lentiviral gene therapy for CCALD (the TG04.06.01 Study), page 98

34. To the extent differences in the design structure may be materials, expand your disclosure to compare the design structure of the TG04.06.01 Study with your proposed clinical study plan for you COMET Study and how, as you note on page 99, it was helpful in informing the design of your future COMET Study.

35. Please provide narrative disclosure to the MRI scans provided on page 99 to more clearly describe what they depict with respect to disease progression and the TG04.06.01 Study's results.

Planned phase II/III clinical study (the ALD-102 Study or the COMET Study), page 100

36. Please describe how you intend to attract or recruit patients for your trials.

Clinical development of our LentiGlobin product candidate, page 104

37. For each of your planned trials, please describe how you intend to attract or recruit patients.

Our strategic alliance with Celgene, page 111

38. Please expand your disclosure to disclose the material payments under this agreement, including the aggregate milestone payments and provide a range of the royalty payments within a ten percent range (e.g. low-single digits, teens, etc.).

Intellectual Property, page 114

39. We note that you provide the date that you expect your issued patents to expire. Please confirm that you are not including in this date a potential pediatric extension, extension under the Hatch-Waxman Act or another similar extension. Alternatively, please revise your disclosure to provide the expiration date of your issued patents as of a recent date.

License Agreements, page 118

40. We note your disclosure on pages 79 and 80 that you will be required to make payments based upon development, regulatory and commercial milestones pursuant to your agreements with each of Inserm, Institut Pasteur, MIT and RDF. Please disclose with respect to each agreement the aggregate potential payments due the licensing party.

Director Compensation, page 149

41. Please file copies of your letter agreements with Mr. Lynch and Dr. Maraganore.

Principal Stockholders, page 157

42. Please disclose the identity of the individual(s) with voting and dispositive power over the shares held by each of your five percent holders.

Description of capital stock
Registration rights, page 162

43. Please file a copy of your amended and restated investors' rights agreement.

Lock-up agreements, page 167

44. Once available, please file copies of each of the lock-up agreements.

Consolidated statements of operations and comprehensive loss, page F-5

45. It appears that your pro forma net loss per share includes the gain on extinguishment of preferred stock. Please tell us why it is appropriate to include this gain when you disclose in Note 2 on page F-11 that your pro forma net loss per share gives effect to the conversion of all outstanding shares of convertible preferred stock assuming they were converted at the beginning of the period presented or the dated of original issuance, if later. In this regard, it appears that the extinguishment gain would not occur in July 2012 if the preferred stock was converted on January 1, 2012. To the extent you believe it is appropriate to include the gain in your pro forma net loss per share, please explain to us how the economics of the Series D transaction in July 2012 would be the same in January

2012. To the extent appropriate, please reference for us the authoritative guidance you rely upon for your computation.

Notes to consolidated financial statements
Note 2. Summary of significant accounting policies
Warrants to purchase convertible preferred stock, page F-14

46. In the first whole paragraph on page F-15 you indicate that various series of preferred stock are classified within temporary equity at the end of 2012 because of the associated liquidation preferences. Please provide us your analysis supporting the classification of these series of preferred stock, referencing the authoritative literature you rely upon to support your accounting. In your response, please tell us how you considered the guidance in paragraph 3f of ASC 480-10-S99-3A related to redemptions upon liquidation events.

Revenue recognition, page F-15

47. Please clarify your revenue recognition policy related to research fees. Specifically, address the manner in which recognition of revenue over the service period is determined (i.e. percentage of completion method). In addition, disclose the period used to determine revenue recognition on a straight-line basis.

48. With regards to grant revenue, please clarify the methodology you apply to recognize revenue. Revise your disclosure to discuss how you account for any refund provisions. Separately reference for us the authoritative literature you rely upon to support you accounting.

Note 9. Convertible Preferred Stock
Extinguishment of preferred stock, page F-29

49. Please provide us your analysis that supports the difference between the fair value of the new shares of preferred stock issued and the carrying amount of the old shares of preferred stock extinguished that resulted in the aggregate gain of $23 million.

Note 11. Significant Agreements
Association Francaise contre les Myopathies, page F-30

50. Please explain to us why it is appropriate to recognize the revenue under this arrangement on a straight-line basis over the term of the agreement.

Massachusetts life science center, page F-31

51. You disclose that the tax incentive award is refundable if you do not meet and maintain your job creation commitment for at least 5 years. Please clarify your disclosure to

explain if at the end of 2011 you had met your job creation commitment and why this award was recognized upfront given the refund provision.

Note 16. Subsequent events, page F-38

52. Regarding your collaboration with Celgene, please refer to ASC 605-25-50 and 605-28-50, and revise your disclosure to address the following:

- The significant deliverables within the arrangement (e.g. option to license product candidates, R&D services, joint steering committee obligations, call option and target antigen license, manufacturing and supply agreement, opt-in right);
- Whether the significant deliverables in the arrangements qualify as separate units of accounting, and the reasons that they qualify as separate units of accounting, if applicable;
- A discussion of the significant factors, inputs, assumptions, and methods used to determine selling price (whether vendor-specific objective evidence, third-party evidence, or estimated selling price) for the significant deliverables;
- Separately, disclose the effect of changes in either the selling price or the method or assumptions used to determine selling price for a specific unit of accounting if either one of those changes has a significant effect on the allocation of arrangement consideration;
- The general timing of revenue recognition for significant units of accounting;
- Performance-, cancellation-, termination-, and refund-type provisions;
- Describe the nature of and quantify the amount of contingent consideration to be received under the collaboration; and
- Disclose how you will account for the contingent consideration.

Separately, tell us how you allocated the arrangement consideration and your policy for recognizing revenue for each element. In addition, please tell us your consideration to reflecting this transaction in pro forma financial statements under Article 11 of Regulation S-X.

General

If you intend to respond to these comments with an amended draft registration statement, please submit it and any associated correspondence in accordance with the guidance we provide http://www.sec.gov/divisions/corpfin/cfannouncements/drsfilingprocedures101512.htm.

Please keep in mind that we may publicly post filing review correspondence in accordance with our December 1, 2011 policy (http://www.sec.gov/divisions/corpfin/cfannouncements/edgarcorrespondence.htm). If you intend to use Rule 83 (17 CFR 200.83) to request confidential treatment of information in the correspondence you submit on EDGAR, please properly mark that information in each of your

confidential submissions to us so we do not repeat or refer to that information in our comment letters to you.

You may contact Sarah Parikh, Staff Accountant, at (202) 551-3627 or Mark Brunhofer, Staff Accountant, at (202) 551-3638 if you have questions regarding comments on the financial statements and related matters. Please contact Karen Ubell, Staff Attorney, at (202) 551-3873, Jennifer Riegel, Special Counsel, at (202) 551-3575 or me at (202) 551-2715 with any other questions.

Sincerely,

/s/ Jennifer Riegel for

Jeffrey P. Riedler
Assistant Director

cc: Via E-mail
Michael H. Bison, Esq.
Goodwin Procter LLP